The Subject of Speech Perception: An Analysis of the Philosophical Foundations of the Information-Processing Model

by

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I declare that this thesis has been composed by myself, and that the research reported herein has been conducted by myself, unless otherwise indicated.

8th August 1989.

I dedicate this thesis to my father

Donald J. Fraser

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Abstract

This thesis is a metatheoretical discussion of approaches to the study of speech perception. It consists of three separate reviews, and an argument connecting them. The first review is of speech perception research as carried out in the information-processing approach, that of almost all work in this area over the last thirty years. The second is an overview of cognitivist philosophy, the conceptual foundation of the information-processing approach. The major tenets of this foundation are that cognition can be seen as computation, with information being represented symbolically, and the representations processed according to formal rules before being interpreted. The third review is of some relevant parts of the phenomenological philosophies of Husserl, Heidegger, and Merleau-Ponty.

Detailed arguments are presented against the appropriacy of cognitivist philosophy as a foundation for speech perception research, using the work of Heidegger and Merleau-Ponty. The major factor in this inappropriacy is found to be cognitivism's view of the perceiving subject as a symbol-manipulator, for whom the task of speech perception is basically one of transformation of one representation of speech (*eg* acoustic) into another (semantic). Such a view neglects, among other things, the necessity of accounting for the possibility of there being any representation at all. Providing this account involves consideration of the nature of the human subject and its relation to the world. It is argued that, since descriptions are not given by the world in itself (*ie* there is no "neutral" description), but rather arise from a relation of meaningfulness between a person and the world, a human being must be more than a formal system. This discussion involves consideration of the researcher as a human subject, and the conclusion that descriptions of speech should give explicit consideration of the subject for whom the description is relevant, and especially should maintain a strict distinction between the perspective of the researcher and that of the subject being studied.

The last part of the thesis shows the consequences of these arguments for speech perception theory, first by analysing the effects of the information-processing framework on speech perception research; and secondly by outlining an alternative framework for speech perception research based on more appropriate assumptions about the nature of human beings, arising from the preceding arguments. In particular, the task of speech perception is seen not as transformation but as constitution of descriptions. Finally some comparison is made of the interpretation of observations about speech perception in the two frameworks, and some suggested directions for future research are indicated.

Introduction

This thesis is about speech perception, that is, about how human beings come to understand meaningful words, sentences, orders, insults, and so on in the speech of their fellows. In the years since World War II, a considerable amount of research has been carried out on this topic, almost all according to an approach which sees the basic task involved in speech perception as one of information-processing: cues or features extracted from the speech signal are processed or transformed into representations suitable for accessing meanings in a mental lexicon. The key to understanding how this processing is achieved is given by the analogy of cognition (including perception) with computation - an analogy which underlies not only speech perception research but all of cognitive science. The overall theme of the present thesis is the argument that this approach is not appropriate to all the purposes that it has been put to in studying speech perception.

The subtitle of the thesis gives the best guide as to how I would like the argument to be read: the project reported here has been very much one of analysis and exploration. It is an attempt to understand, clarify and explicate some underlying assumptions of the information-processing model of human speech perception. My original motivation in undertaking this analysis was a general dissatisfaction or unease with information processing models as an account of human speech perception (initially with regard to the recognition of word boundaries in connected speech). Although there were numerous models and theoretical approaches around, none of the ones I encountered overcame this unease. Wider reading in cognitive science persuaded me that my dissatisfaction stemmed from some aspect of the metatheoretical rationale for the information-processing approach in general, rather than from features of any particular model based on this approach. This thesis is the result of my attempt to understand the metatheoretical position I disagreed with, and pinpoint the reasons for that disagreement. It can be seen as an extended argument in justification of my reaction: "But people aren't like that!".

It will become clear that in this quest, I found it necessary to delve rather deep among issues that are sometimes thought to be "purely philosophical" and to bear little relevance to speech perception theory. I would like to stress though that my aim throughout has been very specific, and that the issues I have addressed have been treated precisely because of, and with respect to, their relevance to speech perception. This is not meant wholly as defence against an anticipated accusation of irrelevance, but rather to divert any suggestion that the issues I have discussed should be seen as general issues, or that my arguments should be assessed as if they were general arguments. In fact, one of the major philosophical themes of this thesis is the domain-specificity of any framework or foundation, and the impossibility of any general, objective "first philosophy". I would not wish to defend as generally true my conclusions about the nature of human beings and of the world. My claim is that these conclusions are valid in the domain of speech perception research. Their relevance to other domains would have to be demonstrated by other arguments.

There is though an element of defensiveness in my insistence on the relevance and focus of my research. There is, even today, an opinion about that philosophy is one thing and practical progress another. There are certainly areas of both of which this is true. But, as I hope to demonstrate in what follows, the study of human language and cognition are not in this category. For one thing, it is something of an overstatement to suggest that practical progress is a major goal of work in these areas. Much research is undertaken with the (very valid) aim simply of increasing understanding of ourselves and our world. In these cases the definition of what is "practical" becomes rather blurred. For another thing, they are topics of enormous conceptual complexity, and clarity about conceptual issues is vital if confusion is to be minimised. Given these considerations, I think there is more danger in too little "philosophical" work than in too much. It is as a contribution to increasing clarity of this kind that I would most like the present research to be regarded.

Having given this general orientation to the work that follows, I will now turn to a brief chapter-by-chapter overview of the argument that follows.

In Chapter 1, I define a starting point by setting out what is known about human speech perception as seen in the information-processing approach: the basic understanding of the communicative situation and the task faced by the perceiving subject in understanding speech; the main research questions and issues of debate arising from this - that is, the task faced by the researcher in understanding speech perception; and an appraisal of the current status of speech perception research in the opinion of its practitioners. At the end of the chapter, I present my own opinion that the information-processing model is less than satisfactory as an account of human speech perception, and isolate the main reason for this as involving its presuppositions about the perceiving subject. This suggests a need to examine the metatheoretical presuppositions of the approach, which are (with some qualifications) those made explicit in cognitive science, a more general discipline which deals with all aspects of cognition according to the guiding principle that cognition is essentially a species of computation, or symbol-manipulation.

Chapter 2 provides an overview of cognitivist philosophy, often used as a metatheoretical justification for information-processing assumptions in speech perception research. The structure of this chapter is similar to that of Chapter 1 - first the central tenets are set out; then the main questions and debates are discussed (with the focus on issues relevant to speech perception); and finally the climate of self-opinion within cognitivist philosophy is assessed. At the end of the chapter, I begin a more detailed argument in support of my belief that there are major problems involved in thinking of the process of perception as one of symbol-manipulation achieved by a formal system. If speech perception is looking up a mental lexicon, who is playing the role of the *people* involved in use of a real dictionary - the writer and the reader? The cognitivist account rests on implicit but problematic assumptions about the basic nature of the world and of the human subject. The discussion turns therefore to phenomenological philosophy, renowned for its treatment of subjectivity.

Chapter 3 is partly taken up with another overview. It provides brief and very focussed summaries of relevant parts of the philosophies of Husserl, Heidegger, and Merleau-Ponty. Each summary is followed by a discussion of the significance of the work in relation to the problems raised in the preceding chapter. These discussions taken cumulatively constitute a strong argument for the view I call radical antifoundationalism. This view takes very seriously the opinion - often expressed, in fact, in cognitivist philosophy - that the world and the things in it have no particular meaning, or essence, or description, in and of themselves; these are given only by the interaction of a subject with the world.

Chapter 4 takes up and expands these points, exploring the ramifications and implications of radical antifoundationalism in some detail. Its most significant implication in the present context has to do with the nature of the subject who interacts with such a world - the subject could not be a formal system, or operate (only) according to formal principles. Radical antifoundationalism also has implications for a view of science, stressing the domain-relativity of concepts and methods, and the need, in developing or assessing some scientific endeavour to consider the characteristics of the subject in the sense of topic or domain. The latter part of the chapter considers some of the tenets of cognitive science from the perspective reached with these arguments, with specific reference of course to those tenets which play a role as part of the philosophical justification for an information-processing approach to speech perception.

Chapter 5 returns the discussion to the subject of speech perception. The first part demonstrates how the rationale for the information-processing approach does indeed depend on an understanding of the nature of the world and of the perceiving subject such as that just found to involve so many conceptual problems, and how some of the key difficulties faced within speech perception research can be traced to these very conceptual problems. In fact, it is here, rather than in Chapter 1, that I discuss some of the issues that motivated the analysis which became this thesis, as described above (giving some weight to a point I make in Section 4.3.3). The second half of Chapter 5 suggests an alternative approach to speech perception which takes as its starting point an understanding of subjectivity, both of the hearer and of the researcher, like that developed in the course of the argument.

Naturally, I am committed to the framework I develop in Chapter 5 as an interesting and fruitful approach to research in speech perception - but I would like to make clear my attitude to it. It was only at a certain stage in the development of the work reported here that it began to be clear that my analysis was pointing in the direction of an alternative to the information-processing approach: uncovering crucial presuppositions suggests that changing these presuppositions would define a starting point for a genuine alternative. My primary motivation in undertaking this study has not been the provision of a "better" way of doing "practical work" in speech perception. The aim, as already stated, has been one of understanding and clarification.

Towards the end of Chapter 1 - the chapter which reviews existing research on speech

perception - I suggest that the attitude of contemporary speech perception researchers can be characterised as one of humility in the face of the magnitude of the problem of explaining the ability of human beings to understand speech. This attitude is something that the framework developed here has in common with the information-processing framework. I am reminded of the time when, as a beginning undergraduate, I was taught in biology classes about the body's regulation of the hormone system: my feeling then was one of relief that all this went on whether I understood it or not, and my understanding was in no way responsible for control of the operation. Though in one way, we all understand speech perception with amazing depth and intimacy, when it comes to understanding in the sense of explicit explanation, our total combined achievement probably falls something short of the ability of a first-year humanities student to understand hormones. Given this situation, it is relevant to consider the criteria of explanation we should best impose upon our work. There is a tendency to think that understanding is worthless unless it can be formulated as an explicit and comprehensive theoretical model. But "explanation" itself is relative to the person being explained to. To see a model as an explanation of a phenomenon itself requires a leap of faith in the analogy supporting the model. Personally I believe that we are not up to the stage of making specific models of bits of speech perception - because we lack sufficient understanding of a broader framework in which to interpret them. Given this situation, criteria such as "how does my idea stand up as a theory according to certain presuppositions about what makes good science?" are (though certainly not unimportant) less important than "how does the idea make sense in terms of an understanding of speech as communication between human subjects?". I for one am rather content that the only real test of our understanding - trying to engage in conversation by acting according to the theory - is, like regulating our own hormones, impossible.

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Chapter 1

REVIEW OF RESEARCH ON HUMAN SPEECH PERCEPTION

1.1. Introduction

In this first chapter, I provide an overview of the kind of research that has been done on speech perception in the Information-Processing (IP) framework, to be used as a basis for the discussion of the rest of the thesis. Later, I will give detailed comments in appraisal of the IP framework. In this review, however, I am concerned to provide a comprehensive and sympathetic description of human speech perception research as seen by IP; so the facts, questions and problems discussed here are facts, questions and problems *within* IP, rather than *about* IP.

The review is a broad rather than a deep one, and does not attempt detailed coverage of every piece of research with a bearing on speech perception, or every model proposed. Its aim is to outline the framework and general characteristics of IP research, standing back to look for similarities, where a more narrowly focussed review would see differences. It is concerned to make explicit the common assumptions and approach to problems shared by IP researchers, and mark out the range of possible answers, indeed, possible questions, which arise within the framework. So where there is general agreement about a particular topic it is mentioned rather briefly; where there are debates, disagreements or puzzles, the issues are sketched and an idea given of the range of proposed solutions or directions towards solutions.

The review is restricted to speech perception research in the IP framework. Other work on perception, contemporary or historical, is not covered in this chapter. It is true that not all the research reported here can strictly be said to have been carried out within the IP framework, since some of it was done before the IP research programme was fully formulated. These early findings are included because they have been interpreted within the IP framework, and in fact, as will be clear, contributed to its development.

The chapter is divided into several sections. First there is a brief description of what is meant

by "IP framework", and how this view sees speech perception in a broader context of human perceptual and cognitive abilities. Next there is a short characterisation of speech perception as seen within the IP framework - a common core of understanding about speech perception from which most current work takes its starting point. Third, there is a section exemplifying some of the issues and debates that are currently alive in speech perception theory. Fourth, there is a section which looks in more detail at an area of speech perception research - study of word recognition - in the light of the more general overview of the early sections. Finally, I consider the status of IP in the self-appraisal of IP researchers, and the directions speech perception research seems to be moving in.

1.2. The Information-Processing Approach

The task of defining and situating the IP style of speech perception research is not a straightforward one: both this field and the ones to which it is most plausibly related are diverse and rapidly changing areas of study. It can perhaps be loosely classified as a branch of psycholinguistics, which can in turn be loosely classified as a branch of cognitive science, an interdisciplinary research programme concerned with the study of all aspects of human cognition. It is the relationship of speech perception research to cognitive science, rather than psycholinguistics, that will be focussed in this thesis, so the looseness of the intermediate classifications need not be of great concern (see Chapter 2).

The central cohesive theme of cognitive science is the drawing of an analogy between human cognition and computation - or information-processing, or symbol-manipulation[1]. "Information-processing" is thus a general characterisation of human cognitive activity, according to which information is represented symbolically, and the symbols "processed" - *ie* transformed in various ways and combined with knowledge stored as representations in memory - to produce complex, intelligent behaviour as output. It is this idea, with its ramifications, which provides a setting or framework within which speech perception can be conceptualised and studied - the perspective from which hypotheses and empirical questions can be formulated, and according to which observations and experimental results can be interpreted. In very broad outline, the relevant framework is as follows.

Speech communication is seen as a process of message transfer, in which the speaker converts a meaning (the message) into sound (articulatory gestures with acoustic consequences) which is transferred to the ear of the hearer. The hearer receives the sound and matches it against meanings, similar to those of the speaker, stored as part of his or her own linguistic knowledge. The goal of speech perception is thus the retrieval of the speaker's meaning; the sounds are the raw material the hearer has to work with, and the hearer's knowledge and processing system, as it were, the tools to be used to achieve the goal. This overall view of communication is often called the "speech chain" (Denes and

[1]The background of cognitive science will be discussed in detail in Chapter 2.

Pinson 1963), and the various branches of speech studies identified according to it. Speech perception is the "decoding" operation of matching the sound against meanings, or transforming the sound into meaning, or extracting meaning from the sound.

> "It is clear enough, in general, what the goal of speech understanding is: to map from a speech level onto some message level, or interpretive representation." (Marslen-Wilson and Tyler 1981)
>
> "Recognition involves matching an input to a pre-stored representation. In the case of speech recognition the input is an auditory representation and the pre-stored representation is conceptual; speech recognition consists in the translation of sound to meaning." (Patterson and Cutler in press:36)

The question addressed by IP research then is *how* this translation or mapping is achieved.

A central, defining tenet of IP is that it cannot be a straightforward matter of directly matching units of sound against units of meaning: the relationship between the signal and the message is too complex and variable for that. (I will discuss this in detail in the next section.) Rather, the units of the speech signal have to be transformed before a shape is achieved which can be used to access the stored meaning. This transformation is seen, in the framework of cognitive science, as a kind of information-processing: the hearer extracts cues (or information) from the signal (speech wave), and processes them through several stages of transformation (or "recoding"), making use of the hearer's knowledge of the language, the world and the situation, Finally, a "canonical" form is achieved which can be matched with a form stored in the mental lexicon (that part of long-term memory concerned with knowledge of words and their meanings) and associated with the meaning stored there.

As the words are put together, further (syntactic) processing, involving hypotheses, inferences and predictions is carried out to put together the whole message-meaning. These processes interpret what has been heard, and guide the perception of the speech still coming in. Thus a conceptual representation of the speaker's meaning is built up, and the hearer comes to understand the speaker's message. From there, further inferences can be made in relation to the communicative situation, and a pragmatic interpretation of the speaker's intentions can be made if the message is non-literal, ironic, evasive etc.

A rough distinction has sometimes been drawn between "speech perception" and "sentence processing"[2], the former being to do with the recognition of cues, and their combination into linguistic forms up to the level of the word (and perhaps mainly in the province of phoneticians); and the latter with the understanding of strings of words and construction of semantic representations (perhaps mainly the province of psycholinguists). Most researchers involved with either aspect would stress, though, that the two levels are not strictly separable, and increasingly the two groups are encroaching on each other's territories, especially where they converge in the domain of word recognition. The focus of

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[2]A third division is also sometimes recognised: that of discourse interpretation. For example: "Discourse processing has only recently become a major focus of attention, though studies of word and sentence processing *in a discourse context* go back some ten years or more." (Flores d'Arcais and Schreuder 1983:3-4, their emphasis)

this chapter is on the IP account of word recognition (see Sec. 1.6), though the discussion does range a little more widely in both directions.

This has been a very general, simplified account of the IP view of human speech perception. In the remainder of this chapter, I will review the research carried out within this framework, and point out some of the elaborations and issues which have arisen.

1.3. Central Findings of the IP Approach

1.3.1. The Speech Signal

A major consideration in developing such an account of human speech perception is the nature of the speech signal itself[3], since this can be assumed to have an important bearing on the nature of the processing that needs to be carried out to transform that signal into discrete units of a form which can be matched against entries in the mental lexicon. In fact, discoveries about the speech signal were an important factor in the development of the IP model. Until the spectrograph and pattern-playback were available, it had been assumed by those who thought about speech perception[4] that the signal must be composed of, or decomposable into, phonemes, the smallest unit of language, and that perception was a simple matter of recognising and concatenating these into word-forms to be matched with their meanings. Acoustic phonetic research, however, demonstrated fairly conclusively that that is not the case. Phonemes were not simply "given" in the signal, but had to be actively recovered or reconstructed by the hearer.

The earliest findings (*eg* Joos 1948, Potter Kopp and Green 1947, Liberman 1957) of these new techniques involved the discovery that, contrary to expectations, the speech signal is not naturally or obviously divisible into any clearly defined, linguistically relevant units. In an acoustic description, the signal is a quasi-continuous stream; the breaks or segmentations that do occur are not obviously correlated with any of the units or segments that appear to the hearer to be "there" to be matched with their meanings. This fact is traditionally called the "segmentation problem". It is neatly stated by Sawusch 1986:51 (who also provides detailed discussions of both this and the non-invariance problem discussed next):

> "The subjective experience of understanding spoken language includes the organization of the speech signal into a sequence of discrete units: phonemes, syllables, and words. The speech signal, however, is continuous, reflecting the continuity of articulatory movement in production."

Another, related, early discovery about the speech signal is called the "non-invariance problem". In few, if any, cases is there an obvious, invariant, one-to-one relationship

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[3]"The first task of any perceptual study is to define the stimulus." (Studdert-Kennedy 1974:2354)

[4]I am of course limiting my discussion entirely to what is relevant to IP, ignoring, for example, prior "discoveries" of instrumental and auditory phonetic research which were not taken up as a basis for perception research (see for example, Laver 1970:55ff).

between an acoustic feature of the signal, and a linguistic feature of the message. This is the result of "coarticulation": in the production of speech, the exact form of a speech sound is influenced not only by the linguistic segment intended, but also by its neighbouring sounds and its structural position. Separating out these influences to attain the original intended segment is often very difficult to do and results in considerable ambiguity - there is a many-to-one relationship between surface realisation and underlying intention.

These two facts - segmentation and non-invariance - are considered to be part of the defining problematic of speech perception research, and are referred to in almost every work on speech perception[5]. They provide the rationale for the IP model: it is because of these properties of speech, according to IP, that speech perception cannot be a simple process of matching "templates" stored in the memory against the incoming signal, or of "filtering out" the variable or redundant parts of the signal to be left with the message alone. Combining these observations with the outline given above, the central question of IP can be stated as follows:

How, given the facts of segmentation and non-invariance, does the hearer retrieve the discrete units that encode the meaning of the speaker's message?

The general orientation of research, as already mentioned, has been to assume that the hearer's identification of the speaker's linguistic units is achieved by extraction of cues from the speechwave which provide the necessary information to base a reconstruction on. A sub-goal of IP, then, is the identification of the cues used by the hearer, and description of the signal in "psychologically real" terms. It is usually agreed (Studdert-Kennedy 1976:245) that at the lowest level speech is represented in some way similar to a spectral description (as opposed to, say, a time-amplitude description). This has meant that spectrograms and synthesis based on spectral features have been used extensively in identifying cues to speech sounds. Acoustic cues have been sought by study of spectrograms, and by carefully manipulating synthetic speech and noting the effects of different features on perception. In this way it has been found that, for example, formant pattern is an important cue for vowels, silence and release burst for stops, random energy in various frequency bands for fricatives, etc.

Specifying exactly what the cues are, though, beyond such rough descriptions is more problematic, and still constitutes an important focus of research. The problem, as stated above, is that coarticulatory effects cause the cues for different segments to depend on what other segments are adjacent, so that cues are "smeared" or "spread" over several segments. Thus, any particular time-slice of speech may well contain cues for more than one segment. Conversely, any particular segment can have several possible cues, with different ones being relevant in different contexts. This is assumed to be in keeping with the general

[5]See Pisoni and Sawush (1975:17) for just one example of an account very similar to the one I have given here.

tendency of language towards redundancy. Cues are often said to be in "trading relationships" with one another.

> "It has been well known for many years that several cues may signal a single phonetic contrast ... Thus it is possible to demonstrate that when the perceptual utility of one cue is attenuated, another cue may take on primary effectiveness in signaling the contrast under scrutiny because both cues, it is assumed, are phonetically equivalent." (Pisoni and Luce 1986:18)

This means that, from the researcher's point of view, very often there is more than one way of describing an aspect of the speech signal. It is not always at all clear which is the most salient as far as the perceiver is concerned. A good example of this kind of issue can be given by a case where the problem does seem to have been resolved, to some extent at least: the cue for the feature "voicing" for stops and some other sounds. There are various signal characteristics associated with phonological voicing of stops (voice bar, aspiration, strength of release burst, etc), none of which was acceptably reliable as an indicator of the phonological feature. However, since the work of Lisker and Abramson (1964), many would now agree[6] that what is most salient to perception of the voicing of a segment is the relational cue of "Voice Onset Time" (VOT). The other characteristics of stops can then be accounted for as byproducts of the timing of voice onset.

This issue of cue specification is very closely related to another major problem in the description of the speech signal: that of deciding the size of the unit of speech relevant in perception. Since this is a topic of current debate, it will be discussed in the next section.

As well as issues concerning individual cues, there is also a more general topic of debate about the description of the signal. It has seemed to some that a description of the speech input based on the acoustic (or auditory) nature of the signal, being so difficult to relate to any obvious linguistic units, is not the most appropriate way to represent the speech signal. The most famous alternative suggestion has been that an **articulatory** aspect of speech should be preferred as the basis of the description. The well-known Motor Theory was based on the salience of articulatory over acoustic representations (Liberman et al 1967). Though Motor Theory in its original formulation now has few adherents, many speech researchers favour the idea that low levels of the processing system use some kind of articulatory representation of the signal. The claim is that underlying the "multiplicity, variety, and equivalence of cues for each phonetic percept" (Liberman and Mattingly 1985:10) (acoustic variability), there is invariance in the articulatory gestures that cause the sounds. Focussing on the articulation thus allows a more economical specification of relatively invariant features of speech and a neat account of various well-known phenomena of speech perception. This (controversial) suggestion has recently come back to the centre of discussion with the growth of the "Ecological" approach to speech perception - see Sec. 1.8 below.

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[6]Though VOT is by no means unproblematic in phonetic theory - see for example Darwin (1976:189).

1.3.2. Processing

As has been seen, a basic premise of the IP approach is that speech perception cannot be a matter of simple template-matching. This is often phrased as the statement that there is not enough information in the speech wave itself to fully specify the message. Speech communication often takes place in noisy environments, so that some of the information is lost in transit; speakers often speak less than maximally clearly. But even without these everyday sources of degradation of the speech signal, any given stretch of speech is, according to IP, open to a large number of possible alternative interpretations, both at low levels of decision as to which segments it contains, and at higher, syntactic and semantic levels of ambiguity.

So before the relevant "template" can be accessed, some transformation or processing is required to achieve a "canonical" (*ie* matchable) form from the input. According to the IP view, this processing (or computation) is active and "intelligent" - *ie* involves the application of knowledge of various kinds, and makes use of inferences and predictions to increase the efficiency of the process.

In this section I will describe some of the central characteristics of this processing as understood by the IP view. Again, issues of debate and current development will be left till a later section.

The processing is generally assumed to take place over a series of several stages or "modules" - though the exact number and arrangement of these is debatable (see below), resulting in proposals of various different kinds of models. At each stage, information or knowledge is represented for a time, and serves as input to the subsequent stage. At each stage the representation is more abstract than at the stage before, so the storage space required is less, the amount of information stored can be greater, and the duration of storage longer.

> "The central assumption of our information-processing model is that a number of processing stages occur between stimulus and response. These processing stages are assumed to be successive and each stage operates on the information available to it. The operations of a particular stage take time and transform the information, making it available to the next stage of processing." (Massaro 1975:599-60)

The basic IP model has three stages of processing, resulting in intermediate levels of representation between auditory representation (sound) and semantic representation (meaning), as shown in Figure 1[7].

Information flows in general from the bottom of the diagram to the top. The first level of auditory representation is usually considered to provide a rather complete representation of

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[7]As explained below, few speech researchers, if any, would support so simple a model as this. However, I follow general practice in putting it forward as a starting point for discussion and elaboration (*eg* Eysenck 1984:3, Studdert-Kennedy 1974, Pisoni and Sawusch 1975:25ff). It is also a historical precursor of more complex models (*eg* Fry 1970:51-2).

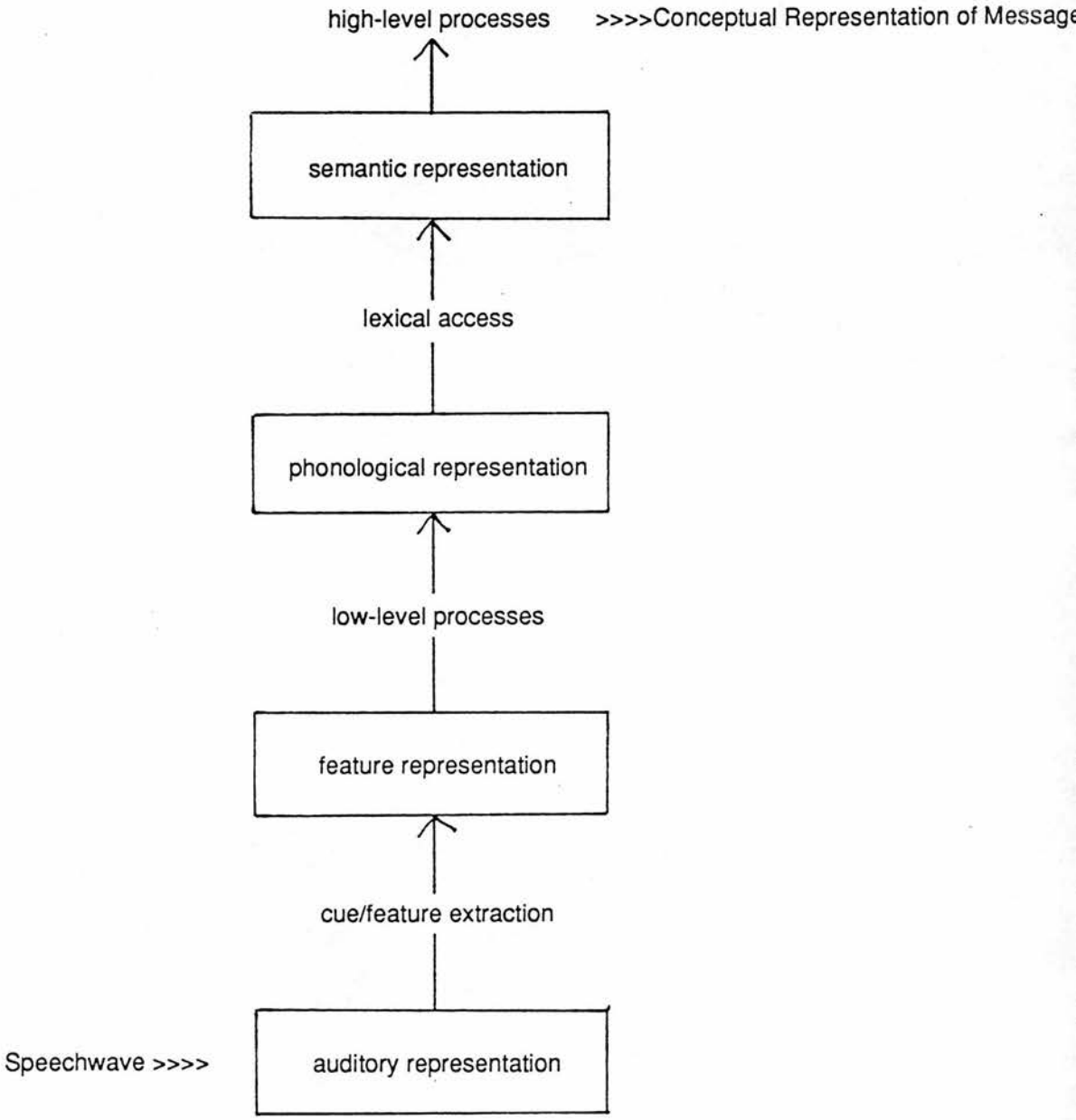

Figure 1: The Basic IP Model of Speech Perception

The input speech-wave is represented and transformed, through several stages of intermediate representation, into a series of forms which can be matched with representations stored in the hearer's mental lexicon, to give access to their meaning, and thus to the speaker's message. Modifications of this model are discussed in the text.

the speech input, and to be of very short duration. Such a storage module (called for example a "sensory register") needs to be postulated so that information in the speech wave can be integrated over some time. It is clear that speech is not recognised directly from left to right (using a metaphor from writing) in an instant-to-instant manner: as has been seen, the effects of coarticulation mean that cues to a single unit are commonly spread over a considerable duration. Also the speech being attended to has to be separated from background noises of various kinds impinging on the ear at the same time, often including other speech (the "cocktail party" situation)[8]. The capacity of this first store is small and information held in it is subject to overwriting or masking by other sounds.

The first stage of processing is the extraction of the relevant cues from this representation, and results in a more abstract representation of the signal in terms of featural units of some kind (see below). Subsequent processing involves the application of "low-level" phonetic and phonological knowledge, and results in a representation on the order of a phoneme string - though whether the elements of the string are phonemes or some other unit is debated - probably with some boundary markers, allowing some preliminary parsing into morphemes, words, or some unit suitable for lexical access. Again the demonstration of many "right-context effects" (instances where identification of a particular segment is influenced by acoustic information which follows it) makes it unlikely that this process can be conducted in a strict left-to-right fashion[9]. Storage at this level is often thought to have a capacity of "7 +/- 2" units, or "chunks" (where the units can be of varying sizes), based on a classic article by Miller (1956); and a duration, unless overwritten or otherwise interfered with, of up to several minutes.

One process that must have occurred by this level, though which level it is carried out at is not clear, is that of **normalisation**. It is clear that there are considerable individual differences in people's voices - even when the dialect is the same, speakers' physiology and speech habits mean that the absolute values of many variables (pitch is only the most obvious example) will differ. Acoustic feature recognition is therefore unlikely to involve features defined in terms of absolute acoustic values (Pisoni 1981). This difficulty is usually treated by assuming that the perception mechanism can normalise according to some (probably very complex) computational principle so that different tokens of the same item are mapped onto similar representations. The details of the principle according to which this is done and the stage of processing at which it takes place are comparatively little-studied, however (Peterson and Barney 1952; Ladefoged 1967, Studdert-Kennedy 1974:2357). A closely related problem is that of rate normalisation: many phonemic and other contrasts are signalled by duration differences, but duration is strongly affected by overall rate of speech.

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[8]Work on auditory grouping, sound location etc is reviewed by Darwin (1976).

[9]Though as will be seen below, some (*eg* Cole and Jakimik 1980) disagree.

Finally, lexical access retrieves the meanings of the words, and syntactic processing[10] allows a complete semantic or conceptual representation of the speaker's message to be constructed. It is this last stage that is stored in long term memory, for an indefinite period and with varying degrees of accuracy. This is the reason that in general people remember the gist of what they have been told, but not, barring exceptional circumstances, the exact words in which the information was conveyed to them, or the actual sound of the utterance (Ellis and Beattie 1986).

The accessing of the meaning of the sounds, though in a sense the last stage of processing, is rarely nowadays thought of as the end of processing, but rather is assumed to interact with lower levels of processing subsequent speech in an ongoing way - most particularly by predicting and constraining the possibilities of what will be perceived next. One of the best known facts about speech perception is its susceptibility to **top-down** influences - often called context effects. Traditional examples of top-down influences[11] are that well-formed, semantically sensible sentences are more intelligible in noise than syntactically or semantically anomalous ones (Miller and Isard 1963); or that having a preconception as to the meaning of a sentence heard in noise can radically alter the way it is heard (Bruce 1958). The well-demonstrated effect of "phoneme restoration" is a particularly good example of this kind of phenomenon (originally demonstrated by Warren 1970). A correlative, and equally well-attested, observation also attributable to top-down effects is that short stretches of speech - especially if extracted from a casual conversation - are often very low in intelligibility if heard without any contextual information. Putting the stretch back into its context, however, makes it sound perfectly intelligible (originally Pollack and Pickett 1963).

Also, as mentioned, a remarkable characteristic of speech as viewed by IP research is its great ambiguity at all levels. Without the operation of "top-down" knowledge, the number of possible parsings for any given stretch of speech would be too great for them all to be tested in the timescale of normal speech perception.

Effects like these are generally accounted for by postulating that some preliminary consultation of the lexicon and even syntactic processing are already operating at least as early as the phonological stage - if not, as many would say, even earlier - and the results made available to lower stages. In other words, information can flow from the "top" down, as well as from the signal "up": once something has been understood of the message, information about its syntax, meaning, etc, is used to make predictions about what will come next, impose constraints on possible or likely interpretations, and generally guide the

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[10]Study of sentence processing and the structure of the mental lexicon are both important areas of research in psycholinguistics, but, as mentioned earlier, I will not deal with either in detail here. See for example Levelt 1978, Garrett 1978 on the former; Aitchison 1987, Rubenstein 1974 on the latter. On inference and interpretation, see Clark 1978. On processing of non-literal meanings and discourse- and text-understanding, see for example Flores d'Arcais and Schreuder 1983.

[11]Reviewed in, for example, Freund (1975).

processing of subsequent speech. Various kinds of monitoring and error-correcting processes are also in operation, allowing backtracking, replaying, etc, if the interpretation seems to be getting very improbable.

1.4. Empirical Questions and Methodology

1.4.1. Questions

Given a basic framework like the one just outlined, many questions arise about how exactly it works - some of which have already been foreshadowed. Much speech perception research can be described as filling in the details of the general IP model. For example, the cues extracted from the signal as the first stage of processing must be specified; the kinds of representation used for storage of the information obtained at each level of processing, and the capacity and duration of each store must be determined; the knowledge available to each level or module must be worked out - most especially the kind of knowledge embodied in the mental lexicon; and of course the details of the kinds of processes that take place, and their exact temporal sequence, must be shown.

The present review is, as mentioned in the introduction, not primarily concerned to detail all the research done with the aim of answering such questions. Though much has been achieved in all of the areas mentioned, especially the first, definitive answers are not yet available for any of them. In many cases, different emphases and orientations can lead to very different kinds of answers, and a number of alternative positions have arisen with respect to issues such as what is the best formulation of the question, or the best approach to finding an answer to it. It is these kinds of issues which will be discussed in more detail below.

1.4.2. Methods

The question of how to go about answering questions about the IP model is itself a problematic one. Almost all the mental processing postulated happens below the level of conscious awareness, and cannot be directly observed by either the subject or the researcher.

One level of which subjects can be assumed to have some reliable introspective information, according to IP, is the final one - they can be asked "What do you hear?". Correlatively, one of the levels over which the experimenter has the greatest control is the first one - the actual speech wave which the processing system is presented as input. By measurement and manipulation of the signal, or by synthesis, the experimenter can be sure of exactly what the input description is, and by elicitation can observe the output. It is not surprising then that the most detailed and best understood information about the perceptual mechanism as seen by IP has to do with the acoustic cues which cause the various linguistic percepts (work reviewed for example by Darwin 1976, Fischer-Jørgensen 1958).

In investigating other levels of perception, the methodological problems are much greater. Even if it were possible to elicit from subjects some description of what was going on in their heads as they perceive speech, such introspective data is notoriously unreliable. From the IP perspective, it is far better to observe subjects' behaviour in various circumstances and thus infer what knowledge is being applied, what processing strategies being followed, etc.

A large range of methods for investigating intermediate levels of processing has been devised. In general, the idea is to "intrude on the ordinary flow of information" (Bever 1983:303-4), observing the effects of depriving the system of knowledge it usually has access to, or pushing it to the limits of its processing capabilities. The basic idea is to ask subjects to identify what they hear under many different controlled conditions. The researcher might interfere either with the signal, which can be done nowadays in very sophisticated ways, or with the conditions under which it is heard. The subject can be asked to identify sounds, or simply to say whether they are same or different.

The lowest, most physiologically determined levels are observed by techniques such as masking, adaptation or dichotic presentation (see Darwin 1976 for a review).

The contribution to the eventual percept of lower levels generally can be inferred by ensuring that subjects are deprived of any higher level (contextual) information normally available from syntax, semantics or context - achievable for example by use of short, isolated or meaningless stimuli.

The higher levels of syntactic and semantic processing, conceptual representation and memory are studied by observing the interpretation given by subjects to different controlled clauses, sentences or texts (Olson and Clark 1976). Some of the techniques used are reviewed by Levelt (1978).

Recently there has been increasing interest in "on-line" experimental tasks - which show the development of a percept from moment to moment: gating, shadowing, phoneme monitoring, listening for mispronunciations are examples. This is based partly on the criticism that in the more "static" techniques, subjects' responses may be influenced by properties of memory or other factors, rather than really tapping intermediate stages of processing; or that they may be using reflective or explicitly learned knowledge, rather than "tacit", implicit knowledge (Morais et al, 1979).

A generally fruitful kind of method used in IP is observation of the kinds of errors that the perceptual system is prone to under different circumstances. The patterns of breakdown allow inferences to be made as to the nature and normal functioning of the system. Perceptual errors can be observed in natural situations, or elicited in laboratory conditions. For example, hearing errors, or "slips of the ear" are interpreted by IP as showing the kinds of units of representation used at different levels (Fromkin 1973 and 1980; Cutler 1982).

An extension of this kind of procedure involves observation of the response of the processing system to errors deliberately incorporated into the input signal - such techniques as listening for mispronunciations, shadowing speech which contains errors, or simply observing the degree to which mispronunciations can affect perception (Tent and Clark 1979).

Finally, a considerable amount of IP research has involved investigation of phenomena observed in the laboratory - such as categorical perception (Liberman 1957, Repp 1984) or click location (Ladefoged 1967; Freund 1975 reviews the work; Olson and Clark 1976 consider the methodological and interpretational problems involved).

In studying intermediate processes by techniques such as these, the designing of experiments is of critical importance. The aim after all is not simply to find out how subjects behave under particular experimental conditions, but to extrapolate to the nature of the speech perceptual mechanism in general, and particularly to its functioning in everday spontaneous conversation. Studying perception of conversational speech poses such difficult methodological problems as to make it unfeasible on a large scale - though of course it is important to verify results obtained in the laboratory on "real" speech. For these reasons, almost all research on speech perception has taken the form of laboratory experiments[12]. Ideally the experiment is seen as a test of a hypothesis arising from a theory about speech perception in its larger context. Given this view, it is important to be sure that hypotheses are well-formulated in terms of the theory, and that the experimental design is a true test of the hypothesis. The task has to be cleverly worked out, variables carefully controlled and inferences cautiously drawn. For all these reasons, it is inevitable that materials and conditions will often be "unnatural" to some extent. This means that extrapolation and generalisation from experimental results to claims about the operation of the processing mechanism in everyday, spontaneous conversation is fraught with danger of misinterpretation.

> "... we should be cautious about interpreting tasks in which we ask our subjects to do slightly unnatural things." (Haggard 1975:10)

The kinds of problems faced by researchers in interpreting experimental results can be illustrated briefly with one particularly notorious example[13] - that of the Reaction Time (RT) paradigm. A very simple measure of the relative complexity of processing undergone by various kinds of input is the length of time taken to complete a process. RT experiments exploit this reasoning - in general they measure precisely the amount of time subjects take to perform a simple task, such as pressing a button for true/false or yes/no, which requires

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[12]This is a source of dissatisfaction to many psycholinguists, but considered to be unavoidable, since the opposite problem of lack of control would cause even greater problems (*eg* Olson and Clark 1976:63). Or at least to *have been* unavoidable in early days of speech perception experimentation - some consider the situation is now beginning to be remedied, with innovative experimental designs allowing more naturalistic speech and contexts to be studied (Pisoni 1986:155).

[13]Similar problems surround the history of "phoneme monitoring" experiments - see for just one example Studdert-Kennedy (1976:252).

some perceptual processing of a stimulus. However, stating *what* processes are going on during the time it takes the subject to react is much more problematic. Some such tasks that were used in the sixties to support detailed hypotheses about the (Chomskyan) transformations being performed by the system are now interpreted very differently. Though RT methods are still used[14], much greater caution and sophistication are required for their interpretation.

In general, psycholinguists are very aware of the problems of interpretation and the "theory-laden" nature of observation (see section 1.7 below). However it is felt that they can be countered by rigour of method and interpretation. It is therefore considered very important to formulate strong, falsifiable hypotheses, control experimental variables stringently and interpret results according to sound logical criteria; as well as to design well-specified models and make assumptions and the theoretical orientation of an experiment as explicit as possible. Morton (1981), Massaro (1987) and Seidenberg (1985) discuss these matters particularly explicitly and give a "feel" for the style of reasoning used in speech perception research.

1.4.3. Modelling

One way of encouraging the kind of rigour just described is by use of computer models. Since perception is, as explained above, seen as a kind of computation, implementation of theories as computer models is possible. A very important aspect of methodology in the IP approach is thus the development of models of the speech processing system, which can then be implemented and tested as computer programs. In fact, the way the IP framework lends itself to modelling of this sort is often claimed as one of its advantages, since it ensures that theories will be well-specified and formulated in terms of testable hypotheses - highly desirable conditions for a scientific enterprise.

> "The main advantage of the [IP] theoretical framework is that it forces consistency in methodology, interpretations, and conclusions." (Massaro 1975:600)

This means that research in Automatic Speech Recognition (ASR) is of relevance to human speech perception theory[15], since the design of a working ASR system would be a very convincing candidate as a (sufficient) description of the human processing system.

An example of the influence of ASR on IP theories can be seen in the large Advanced Research Projects Agency (ARPA) project conducted in the US in the seventies (Klatt 1977), which was widely analysed as to its implications for human models (see for example the papers in Cole 1980, Perkell and Klatt 1986, Nusbaum and Schwab 1986).

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[14]For example, Marslen-Wilson and Tyler (1981:104) consider that RT tasks "provide the best technique for pinning down the exact temporal properties of speech understanding processes" since they "tap the listener's representation of speech at a specific moment in time."

[15]Influences in the opposite direction are also important, but outwith my scope here.

Unfortunately full-scale models of perception have so far resisted implementation as ASR systems. There is some controversy within IP as to the extent to which this is due to technological problems as opposed to conceptual ones (see Sec. 1.7). Certainly the kinds of problems that have been encountered in attempting such modelling are considered to have been illuminating for human speech perception theory - for example in highlighting the extent of the ambiguity of the signal, the importance of time- and speaker-normalisation, the problem of control and error-recovery, or the issues in knowledge representation and access.

In any case, designing and implementing a full working system is a very large task, requiring research to be at a late stage of finalisation. For these reasons, theoretical modelling, rather than actual implementation, of all or part of a system is one of the more common forms of presentation of ideas and argumentation for an approach.

1.5. Issues and Research Topics within the Field

1.5.1. Introduction

Naturally, within the scope of broad agreement about the general explanatory framework of IP, various issues and problems have been encountered and tackled in different ways by different researchers, giving rise to debates and differences of opinion, interpretation and emphasis. In this section I sketch some topics representative of these kinds of issues and the range of opinion as to how they should be dealt with. Some of the issues will be raised in a more specific context in the next section on word recognition.

First I mention some general issues to do with the kind of model best suited to accounting for perception. Then I look briefly at two central questions posed by the IP framework - that of invariance in the speech signal and that of the unit of representation of speech in the processing system.

1.5.2. Architecture of Model

The number and arrangement of the modules needed in a model of speech perception (the model's "architecture") is one area of continuing debate. It is now generally accepted that a simple 3-stage, serial architecture (such as the one shown in Figure 1 above) cannot account for many of the attested phenomena of speech perception. I will talk briefly here about two aspects of the issue of how it should be amended - firstly, how many **modules** or separate stages of processing it should have, and secondly what general kinds of processing the system should do, especially the question of degree to which processing is **interactive** versus **autonomous**, and **active** versus **passive**. Again, I will not be looking in detail at particular models; various reviews are available: Paap (1975), Sanders (1977), Pisoni and Luce (1986), to name but a few.

1.5.2.1. Number of Modules

There is a large range of variation in number of modules among the models proposed by different groups. The examples in Figure 2 might give some idea of the range of proposals. Some consider it useful to have a larger number of relatively specialised modules (*eg* Morton 1981). Others suggest it is more plausible that a human system would have a smaller number of separate stages of processing (*eg* Klatt 1980).

One kind of debate has to do with the necessity or otherwise for postulating particular modules in the system. An example of this kind of issue is seen in the debate about the lower end of the model: whether feature/cue extraction should itself be seen as a one- or two-stage process. Some argue that the first stage of auditory or physiological representation must be followed by a more specialised module operating on the basis of acquired knowledge about language, recoding the information to give a phonetic representation. Others believe that at the lowest levels, phonetic categories have their basis in physiological or auditory properties of the processing system, so that the first representation is already phonetic in nature, and no recoding is necessary[16].

Evidence for the first view (the "dual process" view) comes from the observation that speakers with different native languages "hear" in different ways. Different languages have different patterns of coarticulation, so for the hearer, undoing the effects of coarticulation to retrieve the canonical form involves more than knowledge of universal rules of articulatory "inertia". The second view is supported by evidence that pre-linguistic babies, and even animals, respond to speech stimuli in ways that seem similar to adults' response; and by work on adaptation which gives evidence for the existence of physiological feature-detectors. Work in categorical perception speaks to this debate, though results can be used in support of either view (see *eg* Repp 1984, who reviews the arguments for both sides, though he himself is in favour of the dual-process model. Paap 1975 and Sawusch 1986 also review the evidence, the latter presenting an even more complex "lower end").

Similar kinds of debate surround the need for separate levels of morphological and phonemic analysis (*eg* Jarvella and Meijers 1983), and the separate processing of syntactic and semantic information (*eg* Flores d'Arcais and Schreuder 1983).

A trend in the treatment of these issues has been a call for more concentration on **process** than on **structure** (*eg* Cohen and Nooteboom 1975). In fact this shift of emphasis is sometimes said to differentiate research in the 1980s from that of the 1970s. If it is possible to specify in detail the processes that the system performs, the question about structure will be answered in the process. In any case it is thought likely that there might be rather little in the way of fixed structure, allowing the flexibility of the system.

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[16]Levelt and Flores d'Arcais (1975:348) give a statement of the problem.

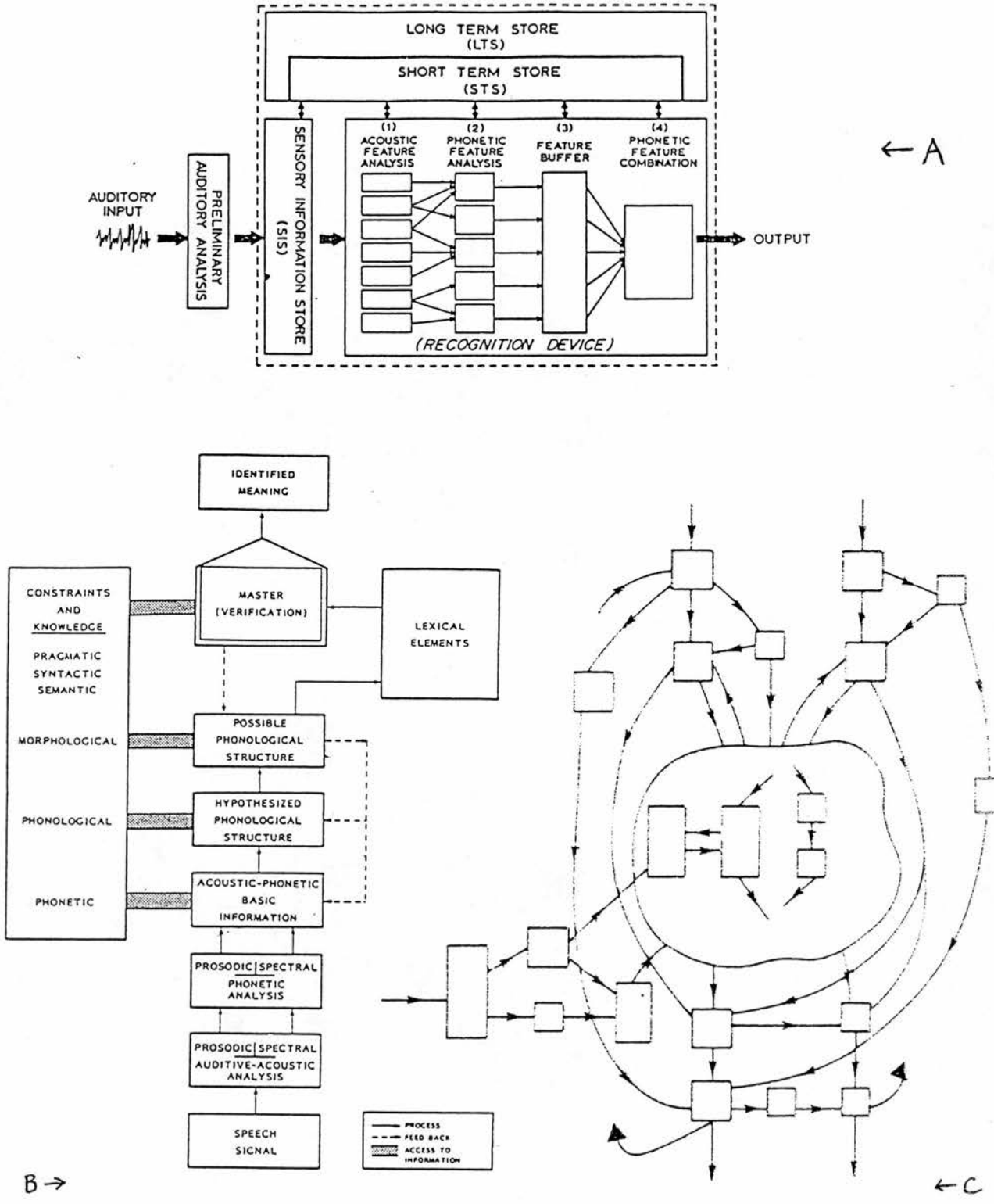

Figure 2: Varieties of IP Model Architecture

A: A model showing some interaction and parallel processing (from Pisoni and Sawusch 1975); B: A prosodically-driven model with analysis-by-synthesis (from Bannert 1987); C: A model integrating speech perception with reading, and production of spoken and written responses (from Morton 1981).

A different but very important kind of question about the number of modules concerns the existence of a separate **control** module. The need for control of the overall processing strategies has been emphasised by work in ASR. For example, one of the ARPA systems, HEARSAY, considered to have a particularly promising design in its "blackboard" architecture, which allowed many different kinds of knowledge to be salient at once, was the one which suffered most for lack of an effective control system. Ranking information for degree of salience, and making it available to the relevant processes in the appropriate sequence proved very difficult. One effect was that if the system made an error, it frequently was not able to recover from it (*eg* Klatt 1980). Any model which uses "strategies" or "heuristic" principles would seem to imply the need for an effective control mechanism.

The most obvious way to deal with control in human perception is to have a separate module with a control mechanism. Some models - especially those of the Analysis-by-Synthesis type, which need some kind of comparator process (*eg* Bannert 1987) - take this approach. If this is not done, some other account of control has to be given. Many however do not explicitly address the problem of control, which is a cause of concern among some speech perception theorists. Noordman (in press) identifies control as one of the key problems facing speech perception modelling in the immediate future. It is closely related to the question of the role of **attention** in human speech processing (see Nusbaum and Schwab (1986), who give a detailed review and discussion of both issues).

1.5.2.2. Varieties of Processing

As mentioned above, the effects of syntactic and semantic context on speech perception have been known from the earliest days of speech perception research. Such effects are widely agreed to be the result of "top-down" information flow: *ie* "higher" levels of processing influencing "lower" levels[17]. It is also fairly well attested that low level information can have a direct influence on perception of higher level units (see *eg* Freund (1975) for a review of some acoustic cues to grammatical structure).

As well, it seems that some stages can be bypassed, or their order varied, at least in some circumstances. A good example is the level of phoneme representation. Phoneme monitoring experiments, as well as other evidence, suggests that the phoneme level is not always accessed in order before higher levels - *ie* those with larger units (*eg* Marcus in Studdert-Kennedy 1980). Others (*eg* Warren 1983) have suggested that the phoneme might not be an intermediate level at all.

These effects suggest that it is not always the case that all stages are traversed in order, with acoustic features being combined to give small linguistic units and larger linguistic units being built up on the basis of information in the intermediate stages.

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[17]See for example Jackendoff (1987, ch. 6) for a clear statement of relevant arguments. Also see Flores d'Arcais and Schreuder (1987:10ff) for some more sophisticated examples of top-down effects than those already mentioned.

Again, then, a simple serial model of speech perception - with information flowing from module to module in one direction only, and the units of representation getting larger and larger - is widely agreed to be overly simplistic. Most researchers would say that allowance must be made for some degree of interaction. The question is, how to model these kinds of interaction. A common approach to this issue is to formulate it as a question about the interaction of top-down ("active") and bottom-up ("passive") processing: in what ways, and at what levels, do they operate together or separately?

A generally accepted principle (*eg* Ohala 1986:386) is that bottom-up processing is the most efficient, and that bottom-up recognition should be postulated to the extent that the speech signal allows it. The crux of the issue then is to specify exactly how far the signal does allow this: in other words the issue of the existence of invariants in the speech wave is crucial (see below).

The standard view for many years was that the most important characteristic of speech was the variability of its units. This has usually been taken to imply a very active model with a considerable top-down component. An unfortunate feature of some such models has been that they can end up postulating a really enormous amount of top-down processing, involving a great deal of very specialised, sometimes rather *ad hoc* knowledge. As well as the general implausibility of such models in psychological terms, one of the lessons learned from the ARPA project (*eg* Pisoni and Luce 1986:24) was that an over-emphasis on prediction and confirmation strategies could have the effect of severely constraining the range of inputs the system could cope with.

One way out of this problem is to suggest that context effects should be accounted for not by active processing and knowledge application, but by changes in the susceptibility of the system to features of the input[18]. In this way, relatively "passive" processing can be used. Recognition of a particular unit can be facilitated by "priming" of some of the stored representations, for example by some aspect of the context, or simply by frequency of presentation. "Primed" representations are then accessed more readily on the basis of less information reducing the need for active, computation-based transformation of information. A prominent and influential example of a model operating on this principle is Morton's logogen model (*eg* Morton 1979), of which more below.

This issue of the interaction of modules also has a wider aspect. "Context effects" in speech perception are not limited to those that can be accounted for by interaction of bottom-up and top-down linguistic processing. Many involve the application of general knowledge - about

[18]Another response to the problem of overly top-down models is to propose a system which is more able to make use of available bottom-up information. More on this in the next section on invariance.

language[19], or about the world and the situation. Such knowledge is presumably not stored individually for every specific kind of cognitive process, but shared by all processes that need it. This widens the scope of questions of interaction between modules to include integration with modules relevant to other kinds of process than speech perception.

There are several commonly discussed topics, which I will exemplify. First, there is the issue of the integration of information received in each of the two ears. Many experiments have investigated effects on processing of presentation of different stimuli to the left and right ears. The integration process seems to take account of various kinds of knowledge and expectations (see Pisoni and Luce 1986, for one review of this research). Another question has to do with the integration of cues for speech perception which are available from sources other than the speech wave itself, the most obvious being visual cues. There is the well-known "McGurk effect" (described for example in Studdert-Kennedy 1980:55) where visual cues to labial consonants can override auditory cues to some other place of articulation. Some speech perception researchers believe that an adequate model should be built around the integration of auditory and visual information (*eg* Massaro 1987). Also well-known but not fully investigated is the contribution of gesture, perceived visually, to the understanding of speech (McNeill, 1987).

There is also the question of the integration of speech perception with other linguistic processes - most obviously related being speech production, and reading[20]. To what extent can these processes share modules? On the one hand, it can be considered parsimonious to suggest that such closely related activities should share processing mechanisms to a considerable extent. Accepting this imposes external constraints on perception models by opening questions as to how compatible the IP model is with what is known of other areas of human mental processing. For example, the relationship of the kind of initial representation assumed in processing models to what is known of auditory physiology and psychoacoustics is beginning to be tackled (Patterson and Cutler in press, Pisoni and Luce 1986:6ff, 1987:37). On the other hand there are benefits in modularity: a system with overly free information flow poses, as has been seen, problems of control[21].

A general trend with regard to both of these kinds of issues is the emphasis on the high degree of interaction between different modules - both at different levels of the speech perception system, and in different areas of the cognitive system as a whole - and the

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[19]For example, some (*eg* Ohala 1986) emphasise the extent to which hearers' "tacit" knowledge about speech and its production is in operation even at the lowest stages. See also Darwin (1976:212) on the effects of hearers' knowledge of characteristics of the vocal tract; Pisoni and Luce (1986:12-13).

[20]This topic is discussed for example by Darwin (1976:207); Paap (1975:194) who criticises the notion that perception is just a matter of running the production machinery backwards; Spoehr (1981) who is specifically interested in the relation between reading and listening; and at length in Allport et al 1987. It is also stated as a major research topic by Noordman in press:2).

[21]A broader form of this kind of issue is the debate on "Is Speech Special?" - do our linguistic faculties operate on the same principles as our general perceptual abilities (especially psychoacoustic sensitivities), or are they in some way qualitatively different? Studdert-Kennedy (1976:244) and Lane (1965) present opposing views on this question.

possible relevance to all stages of processing of many different kinds of knowledge. Some researchers (*eg* Haggard 1975:7, Spoehr 1981:244ff) take the view that all these interactions are best accounted for by the proposal that speech perception uses not a serial but a parallel architecture[22]. However, details of such architecture are difficult to ascertain and specify (Levelt and Flores d'Arcais 1975:347) and they are difficult to implement with current computer technology, so the belief in parallel processing is based on what seems generally likely, rather than on an explicit model[23]. It seems clear that central issues will be compatibility of representations and problems of access and control. Specification of the nature of the representation of speech at various levels, and the relationship between those representations has been a major concern of phonetic research for many years (Fischer-Jørgensen 1958:466), but is still not fully understood. Indeed the notion of interactivity itself is still not entirely clear, one issue being whether modules should have access to each others' processes as they are being carried out, or only to the results of their processes. Flores d'Arcais and Schreuder 1983 review some of the issues in relation to different kinds of architectures. As I mention again below, the principle of autonomous processing in separate modules is strongly defended by some (*eg* Norris 1982, Samuel 1986).

1.5.3. Invariance versus Variability

It has already been seen how a model with more emphasis on passive, bottom-up processes can be considered simpler, and thus more desirable than one which requires a great deal of top-down processing. The history of speech perception research, indeed of acoustic phonetics in general, has been one of a search for invariant features of the speech signal that would allow postulation of relatively direct perception of linguistic units. The fact that this search has so far failed to uncover uncontroversial invariants of this kind has led many to the conclusion that the search itself is misguided in some way. This whole issue of the degree to which speech can be said to contain invariant as opposed to variable cues to its linguistic units, and how cues are used by the perceptual system is currently a key topic of debate in speech perception research (*viz.* Perkell and Klatt 1986).

As already mentioned, a long-time standard view has been to emphasise the degree of variability in the realisation of linguistic units in speech. However, there are several schools of thought which suggest that this view is based on an inappropriate perspective on the signal. Many believe that looking at the speech wave in a different way shows it to have many more invariant features and thus allows a model requiring considerably less computation. Such approaches were given impetus by the well-known success of Victor Zue

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[22]An extreme form of this view is seen in the influence of PDP ("parallel distributed processing", "massively parallel", or "connectionist") modelling on speech perception theory - more below.

[23]A feeling I believe to be widespread is expressed, in an informal conference discussion, by Levelt and Flores d'Arcais (1975:348): "We do not propose to put a lexicon already on the basilar membrane, we only want to emphasise the notion that from early stages processing may take place simultaneously."

(*eg* Cole et al 1980) in learning to "read" spectrograms with a high degree of accuracy, a task which had been considered to be impossible since early studies on "Visible Speech" (*eg* Potter Kopp and Green 1947, Shockey and Reddy 1974). This ability fuelled a challenge to the view of the signal as "impoverished" and radically variable, and allowed postulation of models with more bottom-up information (Nusbaum and Schwab 1986:120ff give a good discussion of this issue).

This kind of thought takes several different directions. Again I will exemplify some.

Some researchers believe that the traditional mode of signal description, in terms of isolated cues, is to blame for the apparent lack of invariants. What is needed, according to this view, is a much richer description of the signal, especially involving temporal or prosodic characteristics, which, it is often felt, have been unduly neglected until recent years. This might allow more invariant cues to be specified. However, others express some disillusionment with this idea believing that prosodic cues have not fulfilled the promise of giving the invariants that segmental ones could not.

Another well-known approach suggests that it is the particular orientation to the speech signal, focussing on steady states connected by transitions, which makes speech appear more variable than it is. If, instead, the focus is turned on the fine acoustic detail in the periods of rapid change *between* steady states, it is suggested, invariant properties of the spectral structure can be uncovered. The best-known proponents of such a view are Stevens and Blumstein (*eg* Stevens 1984; Blumstein 1986), who tie their account of invariants to the theory of Distinctive Features (Jakobson Fant and Halle 1963), and to his own Quantal Theory of speech production. The invariants he discovers are therefore acoustic correlates of the Distinctive Features.

> "...a great deal of information is carried by these one-eighth inch time slots in the spectrogram - much more than one would expect on the basis of the space they occupy in linear time. The auditory perceptual system seems to give special attention to these events that are packed with properties that identify a number of consonantal features." (Stevens 1984:11)

The demonstration of these kinds of invariants is best accepted for stops, though it has been applied to other sounds. A summary of the work is given by Pisoni and Luce (1986:7-10); some disagreements by *eg* Darwin (1976:185,187).

Another way in which it is sometimes argued the traditional description obscures invariants is in paying too little attention to the articulatory origin of speech. This view is taken especially by those who support a Motor Theoretic view of speech perception[24] (*eg* Liberman and Mattingly 1985). Again there are criticisms, either of the existence of articulatory invariants or of their usefulness to the system (*eg* Paap 1975). Still another suggestion is that the search for invariants should focus more on the auditory representation of speech (Lindblom 1987).

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[24]Or the "Ecological" account of perception - discussed more fully below.

On the other hand, there are many who choose to emphasise the role of top-down processing, for various reasons. Cole and Jakimik (1980) consider that interaction of higher and lower level processes is needed "even when the acoustic input is crystal clear" (1980:139): even for a clear signal there are numerous possible parsings. The hearer's knowledge is needed to ensure that the correct one is made.

Others simply believe in the variability of speech.

> "If [speech were not highly variable at the phonetic level] listeners would have no reason to construct the elaborate knowledge base [that his experiments show in operation] that allow them to factor out fortuitous variability." (Ohala 1986:396)

Some in fact suggest that the traditional focus on the invariant features of speech has been to the detriment of perception theory, and that variability is itself an important source of information to the perceiver (*eg* Church 1987). This view is taken by both the alternative approaches to speech perception discussed below. Labov (1986) believes that rather than looking for invariants, we should be trying to understand the sources of variability. There is also the well-known phenomenon that in many circumstances, the hearer needs only a general impression of an "auditory contour" to identify the speech (*eg* Studdert-Kennedy 1980:57).

Perhaps the generally held position is moderate on both scores: on the one hand, the move toward richer or alternative descriptions of the signal is welcomed - if the information is there, it makes sense that the hearer would use it - though without great optimism about the existence of a specifiable set of invariants. On the other hand, existence of *some* invariant acoustic-linguistic relationships seems likely (*eg* sibilants would be good candidates), and again it can be assumed that the hearer might use these as "anchor-points" in recognition. Such units would be particularly useful if they allow alignment of boundaries. Coker and Umeda (1975) build this notion into a model which uses "synch pulses" to align input and "transcription".

1.5.4. The Unit of Perception

The problem of what the unit is that the speech signal is segmented into is still a major unresolved issue, and no general agreement has been reached as to the size of the unit the perceptual system operates with. Most of the units of linguistic analysis have been suggested and supported with some evidence, as well as some new units arising from psycholinguistic and ASR work (for a detailed review, see Lehiste 1972; Patterson and Cutler (in press) review units; Pisoni and Luce 1987:26 review some of the issues). Here I mention some of the most-discussed units and some of the arguments for postulating them.

Since the **feature** is, to many, the smallest unit of linguistic analysis, it has seemed an obvious choice as the unit in which the speech wave is initially represented. Since use of features changes the dimension of segmentation, relative to that of the phoneme, they are

useful in accounting for the fact that segment boundaries are so unclear in the speech wave, giving a neat explanation of coarticulation as "feature spreading".

Some (*eg* Stevens 1971) support the binary Distinctive Feature set as the basis of perception, claiming that, in listening to speech the hearer has to decode the signal to recover the original Features and thus build up the speaker's message. He acknowledges that in natural speech information about the Distinctive Features is often lost or distorted, but still: "They have the important function of providing a framework that underlies the production and perception of speech." (Stevens 1971:232).

Others oppose the rigid binary set of Distinctive Features, and propose instead more "natural" phonological features, or a parametric representation (Pisoni and Luce 1986:4-5), perhaps based on physiological feature detectors (*eg* Cooper 1979; see discussion in Darwin 1976:195ff; Crowder 1981:176 argues against them, as does Studdert-Kennedy 1981:53). The problem then of course is to specify exactly which features or cues are used. Here too there is not yet a single well-accepted answer.

Another traditionally popular unit is the **syllable**. It is argued in its favour that most effects of coarticulation are found within a CV syllable, and the syllable as a unit is therefore less variable than phoneme-sized units, posing fewer problems in factoring out production effects and retrieving the intended form. On the other hand it is often pointed out that many coarticulatory effects spread far beyond individual syllables, and that syllable boundaries are no easier to define than segment boundaries. Studdert-Kennedy (1974, 1976, 1980) is a strong supporter of the syllable as the basic acoustic unit, though cautioning that this is a very different statement from saying the syllable is a basic linguistic unit (*eg* 1976:253). There have also been new units - diphones, demisyllables - developed as modifications of the syllable (hoping to overcome the problems of syllables) for use in ASR.

Despite the long-established problems in postulating the **phoneme**, or some similar phonological segment, as the unit of segmentation, some consider that the difficulties are outweighed by its advantages. Principal among these is its "psychological reality", as evidenced by hearing errors and the existence of alphabetic writing systems, for example (see Paap 1975:194) or empirical evidence like that from phoneme-monitoring experiments (Paap 1975:176; Nooteboom 1981). Others counter that the psychological reality of phonemes may be overemphasised by the fact that most psycholinguistic research is conducted in cultures with alphabetic writing systems; and that the phoneme-monitoring work and hearing error evidence are open to other interpretations.

A possible half-way suggestion that has arisen from ASR work is that initial segmentation is into broad class units - roughly phoneme-sized, but analysed only to the level of "voiced fricative, front vowel" etc (*eg* Ringeling and Eefting 1987). This allows more robust front end processing, but still narrows down the number of candidates for lexical access considerably. Another suggests that some kind of context-sensitive allophone is used.

Pisoni and Luce (1987) give strong arguments and detailed evidence in favour of some phonological segment:

> "...units like phonemes which are defined within linguistic theory are probably not good candidates for processing units in real-time analysis of speech. However, units like phones, allophones or context-sensitive diphones may be more appropriate..." (Pisoni and Luce 1987:26)

The idea that the **word** is a unit even at low levels of processing has many advantages. It would certainly be very useful in explaining all kinds of "real-word effects" (many experimental results show biases in subjects' responses if the material is a real word as opposed to a meaningless sequence of phones: see Samuel (1986) for a detailed and interesting review), and would simplify the processing needed for lexical access. However, the problems of using words as units are also very great - their immense variability, the difficulties of providing a formal definition, and the lack of clear word-boundary cues in the speech wave, being the main ones. Also the fact that there are so many words - segmentation into sublexical units means a far smaller set of basic units (Patterson and Cutler in press:43). For all these reasons, it is usually preferred to account for "word effect" phenomena by postulating that information from the mental lexicon is available to lower levels, or that lexical access begins as soon as any information is available from the signal (this is considered in greater detail in the next section).

Despite the problems though, it is sometimes said that the word is unduly neglected as a theoretical possibility (Nooteboom 1981, Cohen 1986), and that more attention might help overcome some of the problems.

> "The only invariant at stake in speech behaviour is anchored through meaning, and in this respect words, as units of meaning each with its phonological structuring, are taken to be suitable candidates for constituting the building blocks of speech." (Cohen 1986:525)

For completeness, I should also mention the **clause** as a postulated unit of processing. As a basic unit of speech it is of course ruled out by the obvious facts of its internal structure, and the fact that parts of clauses are clearly comprehensible. However, its salience as a processing unit in a weaker sense is well-accepted (Flores d'Arcais and Schreuder 1983).

The fact that the definition of the unit of perception has remained an unresolved problem for so long has led some to suggest that it is not the best formulation of the question, and to look for more creative solutions. Some think it is unlikely that one, single, unit is always relevant, and suggest rather that different sized units play a role in different circumstances.

> "The debate over the choice of a perceptual unit can be resolved if a strict distinction is made concerning the level of linguistic analysis under consideration. The size of the processing unit in speech perception varies from feature to segment to clause as the level of linguistic processing changes. Thus debate over the question of whether there is one basic or primary unit is, in our view, inappropriate since there are, in fact, many units that are used at different levels by the speech processing mechanisms." (Pisoni and Luce 1987:11-12)[25]

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[25]Similar views are expressed in Pisoni and Sawusch (1975); and by Barry (1981:235): "... the unit of perceptual analysis cannot be defined rigidly in terms of a particular linguistic unit."

Some believe the problems of segmentation could be overcome by postulating a system in which explicit segmentation is not a necessary stage of processing. A fairly detailed model of this kind has been proposed by Klatt (*eg* 1980): LAFS or Lexical Access from Spectra. In this conception, initial processing gives a representation in terms of sequential spectra, and the lexicon is accessed directly from these. This is made possible without transformation by the fact that the lexicon includes representations of alternative pronunciations. Thus the phonetic and phonological knowledge the system needs is "precompiled", saving the need for transformation into an intermediate phonological representation for lexical access.

Finally, some suggest that emphasising segmentation into discrete concatenatable units is a poor formulation of the problem (*eg* Sawusch 1986:56). It decreases the extent to which coarticulatory information can be a help rather than a hindrance to the hearer (compare the remarks at the end of the section on invariance). Norris and Cutler (1985) argue that what is important in word recognition is not categorisation of the speech wave into a series of units, but rather the ability to use phonetic cues to identify when a boundary has been passed and a new unit is being processed. Stressed syllables, they argue, can be used for this purpose. It is not the case that the stressed syllable is itself a boundary marker, but often the occurrence of a stressed syllable indicates that a boundary has been passed. Also the occurrence of stressed syllables is fairly predictable by the hearer from the rhythm of the speech. (Different languages of course have different patterns of stresses that their users have to learn.) Stressed syllables are also generally very information-bearing, both in the reliability of their acoustic information; and in the sense that knowing the phonological structure of a word's stressed syllable can greatly reduce the number of possible candidates that arise. This latter point has been demonstrated in some much-quoted research by Zue and colleagues (*eg* Huttenlocher and Zue 1983).

1.6. Word Recognition

1.6.1. Introduction

So far the discussion in this review has been very general - necessarily, considering the breadth of coverage that is needed for the argument of the rest of the thesis. In order to give some more detailed appreciation of the trends and developments of work within the IP approach, I would like now to focus on one central area of research - that of word recognition - for discussion in a little more depth.

The basic problem of word recognition is similar to the problem of recognition of every other unit: the fact that there are no explicit and reliable markers of the boundaries between words. Certainly in the experience of the hearer, word boundaries are clearly "there" - to the extent that naive listeners often think they are marked, as in writing, by brief silences. However, it has been known for a long time that in reality, such pauses are rare, and in an acoustic record of speech many (if not most) boundaries are not obviously or distinctly marked at all.

This means that many sequences of segments are ambiguous with respect to their division into words - a fact that lies at the heart of many punning jokes, as well as being implicated in sound change (Cole Jakimik and Cooper 1980 give numerous examples of the "marezy dotes and dozy dotes" kind).[26]

In this respect word boundary marking is an unusual aspect of speech production. It is normally the case that the speaker is relatively careful in providing good quality information for those aspects of speech that are most necessary in the hearer's decoding operation, but:

> "...despite all the examples ... of speakers constraining their output in many and varied ways to make things easier for the listener, the one thing which speakers could do which would be particularly useful for listeners, namely provide precise information as to where one word ends and the next begins, they do not." (Cutler 1987:31).

The question is, then, how do hearers recognise words[27] - *ie* match them with entries in the mental lexicon and access their meanings.

Some languages seem to make the hearer's task fairly easy - *eg* by always stressing some particular syllable of each word, or by having a simple phonotactic structure. In English the situation seems to be particularly difficult, due to our complex phonology.

> "In English, where relatively unconstrained syllabification and free stress patterns exist, word-boundary disambiguation is more critical than in languages where fixed word-stress or more restricted syllable structure reduce potential ambiguities to a minimum." (Barry 1984:529)

I will discuss briefly two general approaches to this problem - which I call a phonetic approach and a psycholinguistic approach, principally because historically most work in the former has been done by phoneticians (traditionally interested in specification of cues used in recognition of phonological units) and in the latter, by psycholinguists (traditionally interested in sentence-processing) (Pisoni and Luce1987:22). This is certainly not a strict division, and increasingly the two are joining forces.

1.6.2. Phonetic Approach

The first - and older - approach arises out of an understanding of speech perception like that given in the basic serial model outlined above, in which the incoming signal is used to construct a representation in terms of small linguistic units, which are then combined to make larger units of a form which can be matched with the representation stored in the mental lexicon, allowing access of the semantic and other information stored with that form.

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[26]This has also of course been of interest to phoneticians for a long time. Gårding (1967:5ff) gives some historical background, as does, more briefly, Barry (1981).

[27]In fact, of course, "word" is not the best word here: whether the relevant unit is the word or some other unit is debatable. What is important is that it should be the unit of lexical access. In common with most current practice I will use "word" as a cover term, in the absence of consensus about the relevant unit. *Cf* Flores d'Arcais and Schreuder (1983:26): "The isolation and identification of single word units is an essential phase in the process of understanding a sentence. Whatever the psychological status of a word may be, at some point we have to isolate and recognise the words in sentences and look up their meanings in our mental lexicon."

Achieving lexical forms from a long unsegmented string of phonological units would be computationally very costly - if every possible combination had to be checked against the lexical entries - and very open to ambiguity and error. It could be expected that speech perception would be more efficient if information as to where words begin and end is available in the signal, and retrievable at low levels of processing. Otherwise word boundary decisions would need to be made at high levels, presumably involving some complex disambiguation and hypothesis testing processes. A considerable amount of work on word recognition has therefore been concerned to specify the extent to which the speech wave contains cues that could aid the hearer in low-level segmentation into word-units. One kind of acoustic cue that would presumably be particularly useful would be those marking where one word ends and another begins.

> "To understand speech, we must hear words, and to hear words, we must know where they begin and end." (Nakatani and Dukes 1977:714)

A major focus of work in the phonetic approach then has been to specify the extent to which the signal does actually contain such low-level cues to word boundaries, and the extent to which hearers can make use of what cues there are.

One of the earliest studies was by Lehiste (1960)[28]. She used a now-classic technique. First, she recorded phrases which contained strings of segments identical except for the position of the word boundary (or "juncture") (*eg* "white shoes" vs "why choose"; "grey day" vs "grade A" etc). Next the minimal strings were excised from the recordings, and played in random order to subjects who were asked to identify which of two possible phrases they thought they were hearing. Their responses were scored, and spectrographic observations made to determine which cues subjects seemed to be using in making their judgements.

Since then, this has become a standard paradigm, and the results of subsequent word boundary experiments on English are frequently compared to hers, similar phrases often being used to make the comparison easier. Results are interpreted as showing the percentage of word boundaries that are available to the hearer from cues in the speech signal itself, since no higher level information is available to differentiate the excised phrases.

For English, it seems to be the case that, overall[29], subjects can retrieve between 65% and 85% of word boundaries in such experiments. It is generally accepted that the results obtained depend on the kind of speech used - the more carefully enunciated the speech, the more clear cues to word boundaries will be available. "Laboratory speech" is usually agreed to be more carefully enunciated than "real speech", so that these experimental results are

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[28]Though note that her intention in carrying out the study was not strictly related to speech perception as such. Rather, she was concerned to make theoretical linguistic statements about the status of "juncture" as a phoneme in structuralist phonology. Her results have since been interpreted with respect to speech perception theory.

[29]Compare Lehiste (1960), Barry (1981:278), Hoard (1966); O'Connor and Tooley's (1964) results are lower, but they limited their data to contain only single consonant boundaries.

higher than would be expected from spontaneous conversational speech. For this reason, some experimenters have embedded their word boundary pairs into more natural sounding contexts, rather than having a speaker read the phrases in isolation. In practice, this has usually meant that the speaker reads a specially constructed passage (*eg* Barry 1981). This is felt to be not entirely satisfactory, but necessary, since using conversational speech presents too many problems of control.

Closer examination of these percentage scores shows that some kinds of boundaries are more consistently detectable than others. Spectrographic analysis and speech synthesis[30] have given a good deal of knowledge about the kinds of cues that signal a word boundary in various segment types. For example, stop clusters usually provide fairly reliable cues ("bead sticking" vs "beads ticking"); nasals between two vowels usually make the boundary very difficult to locate ("an aim" vs "a name").

There seems to be some consensus that post-junctural cues (*ie* those marking word beginnings) are more reliable than pre-junctural (marking word-endings)[31]. Some studies also suggest that most of the acoustic information needed to identify the boundaries is at the juncture itself, at least for English (*eg* Nakatani and Dukes 1977; though Cohen 1988 finds little evidence for this). On the other hand, there has been a long tradition (since the early work by Lehiste) of emphasising the importance of prosodic cues - which might suggest that information from a longer stretch is also relevant.

Research has also been done on a wide range of other languages (*eg* Lehiste 1964; Gårding 1967; Quené 1985; Shimizu and Dantsuji 1980). Insofar as these studies allow comparison, the overall perceptibility of word boundaries seems broadly similar, though languages vary considerably in the actual phonetic devices they use to signal junctures (*eg* in Japanese word boundaries are signalled more by prosodic cues of pitch, amplitude and duration than by allophonic variation (Shimizu and Dantsuji 1980). Word boundary cues have therefore to be specified as part of the phonology of particular languages (Lehiste 1964:196).

These results generally are interpreted as demonstrating the need for a substantial top-down component in word recognition - *ie* high level constraints and predictions based on syntactic, semantic and situational knowledge are available to the lower levels. The effects of subjects' use of statistical knowledge of word frequency (or familiarity) and phonotactic information have been observed by many investigators in biases in the results they obtain (*eg* Gårding 1967 passim; Quené 1985).

> "When effective cues are lacking, a listener may resort to grammatical analysis" (Gårding 1967:62)

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[30]Modern signal manipulation techniques allow perceptual experiments with natural (*ie* not synthesised) speech, (*eg* Barry 1984). Cross-splicing has also been used as a technique (*eg* Nakatani and Dukes 1977).

[31]*Eg* Gårding (1967:34), Nakatani and Dukes (1977), but *cf* Barry (1984:535) who, while supporting this observation in general, warns that it is probably "too undifferentiated".

Extrapolation from these experimental results to the situation in conversational speech is somewhat complex. Spontaneous speech is considered to be on the whole more "sloppy" than read speech, and to have fewer distinct and reliable boundary cues (Shockey 1973). For one thing the common process of cluster simplification can reduce the effectiveness of many cues. As well, it is a well-known phenomenon of speech production that speakers often restructure the phonology of connected speech: resyllabification is a common process and inevitably results in the hearer receiving misleading word boundary information (*eg* [ˌmeifil 'droud] for "Mayfield Road"; *cf* Gårding's observation of this effect in her "context material").

Thus, in conversational speech the hearer has less reliable bottom up information and presumably has to do more top down pocessing to compensate. On the other hand the amount of non-acoustic information in the conversational situation is much greater, and the hearer can apply all kinds of knowledge from many sources in predicting and constraining possible hypotheses as to the message content.

> "Junctural distinctions vary considerably in their perceptibility, but under circumstances of mixed presentation do not achieve scores suggesting clear junctural categories... This would suggest that *phonetic* decoding of word boundaries is secondary to the clearly categorical function of phoneme identification, and that top-down information has a more prominent place in the perceptual strategy." (Barry 1984:534-5, his emphasis)

There is evidence that high-level information can in fact be more salient to word-boundary decisions than acoustic cues (Austin and Carter 1988).

1.6.3. Psycholinguistic Approach

Recently, auditory word recognition has become a topic of increasing interest to psycholinguistics, which had previously been more concerned with visual word recognition or sentence processing (*eg* Frauenfelder and Tyler 1987:1). Psycholinguists thus come to the problems of word recognition from a different perspective from that of the phoneticians; they are more directly concerned with recognition of words in continuous speech. For example, Cole and Jakimik (*eg* 1980) build an account of word recognition into an overall sentence processing theory - their research aims to specify the "strategies" that the hearer uses in coming to an efficient and probably correct decision about the speaker's message, including obviously accessing the meaning of the words.

This has brought about something of a change of focus[32] in the study of auditory word recognition: whereas the phonetic approach was primarily concerned with the identification of features or segments, so that interaction with the lexicon was secondary, the psycholinguistic approach focusses on this very interaction, seeing word recognition as involving a combination of information from the auditory input and from the lexicon.

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[32]It is important to emphasise however that there is no strict demarcation between the two approaches; it is certainly not the case that the psycholinguistic approach has taken over or replaced the phonetic approach. Some recent work indeed combines the two (*eg* Quené 1985).

Thus this approach challenges the assumption that the form to be matched in the mental lexicon must be completely specified before the matching can begin. There is considerable evidence (*eg* from subjects' ability to "shadow" speech at very short latencies, and from gating and reaction time experiments; Marslen-Wilson 1984 reviews the issues in detail) that hearers begin to hypothesise words very soon after their beginnings have been heard[33] - certainly well before their ends, or the next word boundary marker.

This challenge can perhaps be phrased as a reformulation of the quotation given above in illustration of the rationale behind the phonetic approach: to understand speech, we must know where words begin, and then once we have worked out what the word is, we know where that one ends and the next begins. On this view, then, word recognition becomes an **interactive**[34] or **on-line** task, carried out in **real time**, with information from both the incoming signal and information stored in memory being relevant at the same time (compare the phonetic approach, which assumes that the form to be used in access is fully specified before access begins).

> "...the lexicon is not consulted only after a word is identified; it participates in the selection of the identified word." (Jakimik 1979:410)

The nature of the lexicon and lexical access obviously become key factors in such a view. Several new distinctions have been introduced into the theoretical terminology. An important concept is that of a word's "uniqueness point": the point in its left-to-right structure at which it becomes the only word in the lexicon with that structure: *eg* for "spaghetti", this point comes rather early in the word - no other begins with [spəg] (Jakimik 1979); for "spike" the uniqueness point is right at the end. Words sharing the same initial portions (often called "onsets") up to some point are said, following Marslen-Wilson, to form a "cohort".

In some models of speech perception, a word is considered to be recognised when its uniqueness point is reached. It is therefore the same as the "recognition point". In others (*eg* Jakimik 1979), the recognition point can be varied in different contexts, so the uniqueness and recognition points can be different. In this way, the well-known effects of the prior context of syntax, semantics, or context in facilitating identification can be seen as a change to the word's effective recognition point. Either way, an important result is that acoustic information coming in after the recognition point is far less critical to the percept, and is less closely attended to by the listener. This accords well with observations from hearing errors and experiments such as shadowing and listening for mispronunciations.

The claim of such models is that words are recognised from left-to-right, and in sequence - *ie* that recognition of one word is complete before recognition of the following word begins. This goes against the more orthodox belief in the importance of right-context effects (see Cole

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[33]In Marslen-Wilson's view, around 200-250ms after the beginning; others claim access can begin even earlier (*eg* Dermody et al 1987).

[34]Though still modular; a non-modular interactive model, TRACE, will be mentioned under "Alternative Approaches" below.

and Jakimik's footnote, 1980:153). It also suggests that lexical access is based around word-beginnings (which is disputed by *eg* van der Vlugt and Nooteboom 1986).

Another kind of distinction this approach makes more explicit is that between the different ways in which the lexicon can affect word recognition (Frauenfelder and Tyler 1987). One way is by allowing information about which word-forms have entries in the lexicon to affect recognition, but without access to the semantic and other information stored with the forms. Another is actually to access the entry, so that information as to the word's meaning, syntactic roles, etc can also be used. To what extent these are separate stages is debatable, as is the question of whether the second stage is subdivisible into substages - *eg* if detailed information about the syntactic and semantic relations the word has with other entries is available later than the basic meaning of the word.

Such models have the obvious advantage that explicit boundary markers are less important in segmenting the acoustic signal into accessible forms; the fact they are rare in spontaneous speech is not so much of a hindrance, since these models are less dependent on them. Any information about boundaries that can be gained from the signal can however be assumed to be useful (Quené 1985). In fact one of the problems faced by proponents of these kinds of models is that of ensuring that the system does not mistakenly "recognise" short words contained within longer ones[35].

Such a model accounts well for various phenomena, such as "priming" (where presentation of one word can facilitate recognition of related words); and for the observed rapidity with which prior context can influence perception of words. For example, Cole, Jakimik and Cooper (1980) demonstrate how the same acoustic signal is segmented as one word or two words depending on the context in which it occurs.

A currently popular mechanism for achieving the interactive effect is the **activation** model, of which there are several different kinds. Morton's logogen model, described above, is an example, and can be used to describe the principle of operation. Lexical entries are thought of as units which can be activated by information of different kinds; when the activation rises above a certain threshold, the word is recognised. Any kind of information - acoustic, contextual, etc - can affect the level of a logogen's activation.

Marslen-Wilson's model (Marslen-Wilson 1978, 1987) is considered the most explicit and fully specified such model. It differs from the one just described in that it operates on the principle that at first many word candidates (a cohort) are activated to threshold, subsequent information causing all but one to drop below the threshold. Thus when the beginning of a word is first heard, all the entries in its cohort are activated to a certain level. As more of the word is heard, or more contextual constraints are available, the activation level of those units

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[35]Though there is evidence that shorter words contained like this in longer ones are "primed" to some extent (*eg* Shillcock and Lowe 1988).

with less support dies down, but the ones which do receive support are kept active. When only one unit is left, that word is recognised and its entry accessed.

Such models face several types of problem. One is that of recovery from error. Since the first stage of recognition is activation of a subset of the lexicon - to be narrowed down to one candidate - if the correct word is not, for whatever reason, in that initial cohort, it will never be recognised (Pisoni and Luce 1987:42). It is also not clear yet how well they cope with mispronunciations or non-words, or ambiguous words.

The idea is still actively under development, with work being done to specify the interaction of inhibitory and facilitatory effects (Marslen-Wilson 1987), the precise timing of interactive processes (*eg* McAllister 1988), and other details. There is also considerable work being done to devise experimental tests to distinguish the predictions of different types of model in this class (*eg* Frauenfelder et al 1987).

Although this is a strong movement in psycholinguistics, there is also vigorous defence of more **autonomous** models (*eg* Norris 1982). This issue of interaction versus autonomy is, as will have emerged from the discussion so far, at the forefront of current psycholinguist research - see discussions in Frauenfelder and Tyler (1987), Flores d'Arcais and Schreuder (1983), Pisoni and Luce (1987), for example.

1.7. Current Status of Speech Perception Research

It could be said that the way you look at the progress of speech perception research depends on whether you are an optimist, and see the glass as half full, or a pessimist who sees the same glass as half-empty:

> "The good news is that it has been possible to characterise even a fragment of [the] internal processing. The bad news is that it is but a small part of the system that psychologists eventually hope to understand." (Miller 1983:320)

Either way, I think speech perception research in the 1980's is characterised by an attitude of humility in the face of the magnitude of the problem. Many workers in the field would agree that a great deal has been achieved in the last thirty years' research: for example, perception of CV syllables is now considered to be fairly well understood (*eg* Haggard 1975:30). There is more concern as to whether an equal amount of progress is likely to be achieved by continuation of the same line of development. Perception of connected speech in natural settings is, as has been demonstrated by work in ASR particularly, enormously more complex than was originally thought. It seems possible, to at least some IP researchers, that there is cause for concern about the validity of some aspects of the metatheoretical framework of IP. In this section, I will discuss briefly how the status of IP as an account of human speech perception seems to those who work within its framework. Most of the observations made here will be taken up in considerable detail in the following chapter.

There are basically two kinds of concern: one about how well IP is doing what it is doing; the other about whether what it is doing is the right thing to be doing. With respect to the former, a common self-criticism is that models and theories are often poorly specified, and less than satisfactorily explicit. Pisoni and Luce (1986) give some details of this general feeling; see also Pisoni and Sawusch (1975:16).

> "For the most part, theories of speech perception have been quite general and quite vague, and often inconclusive, at least by the standards used in other areas of experimental psychology. It would not be unreasonable to characterize these approaches to speech perception as preliminary attempts at outlining what a *possible* model of human speech perception might look like. Rarely have specific theories been offered." (Pisoni and Luce 1986:29, their emphasis)

The need to use theoretical models, rather than actual implementations, can allow some hand-waving explanations - especially since most researchers focus (necessarily) on sub-problems rather than attempting to account for speech perception as a whole. This need to tackle individual aspects separately is perhaps also responsible for the feeling that the field in general lacks unity and coherence. It is not always clear how various sets of observations based on different experimental paradigms can be related to each other.

Another widespread kind of concern has to do with the problems of interpretation of experimental observations discussed above. This has two main aspects. First, the relationship of the experimental situation to the everyday conversational situation, and the validity of generalisation of experimental results, is sometimes felt to be very problematic. Need for control in the laboratory means that frequently subjects are tested with synthesised speech, or else with rather unnaturally produced human speech - passages or phrases read in a particular way; and it is very unclear how closely perception of this kind of speech resembles perception of spontaneous speech (*eg* Catford in Perkell and Klatt 1986:161). Also, the choice of materials used in an experiment is constrained by the need to control for variables other than the one being investigated (the items' frequency, length, connotations, etc). This can mean that experimental materials are unlike "real speech" in kind, as well as in production. This problem of confounding variables is wittily but earnestly discussed by (Cutler 1981)[36].

Another difficulty is caused by the fact that the tasks the subjects are asked to perform are not always clearly related to the kind of task they would face in a "real" situation. This has led to fairly frequently expressed dissatisfaction with the "paradigm driven experiment" (Pisoni and Sawusch 1975:20 Levelt 1978:4,21), in which researchers become more focussed on testing how subjects react in different experimental situations than in how these reactions relate to the process of perceiving speech in natural settings.

Secondly, the relationship between an observation and its theoretical interpretation is also known to be problematic. This is partly due to an increasing sophistication among speech

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[36]Though compare Massaro (1975b:36) who finds this particular problem less perturbing: "Confounding variables are easily spotted by the experimenter himself or his colleagues so that this is not a major problem in psychology."

perception researchers with regard to issues in philosophy of science: the notion of the "theory-laden observation" and the acknowledgment that scientific results take their validity from a network of presuppositions, rather than being "absolutely" true (Haggard 1975; Olson and Clark 1976:25: "Scientists are captives of their methods."). This means, as mentioned above, that great care must be taken not to "see what you want to see" in interpreting experimental results.

The appropriacy of incorporating knowledge from related disciplines - especially linguistics and phonology - into speech perception models has increasingly become a contentious issue (Olson and Clark 1976). There have been considerable changes within these "feeder" disciplines themselves over the history of IP ; and in any case, some of the expectations they raised failed to be satisfied within the speech perception domain (notably, there is now considerable scepticism as to whether the units and transformations of linguistics are relevant to psycholinguistics). It is increasingly felt to be crucial to maintain a rigorous theoretical distinction between theoretical researcher's and language user's perspectives (Linell 1982, Pisoni and Luce 1987). Another discipline whose relevance is beginning to be questioned is Artificial Intelligence, which was, along with linguistics and psychology, one of the major components in the development of cognitive science and the general IP model. The strong links that existed between ASR and human speech perception theory, and between linguistics and psycholinguistics are becoming weaker.

The surfacing of all these issues has led to a considerable amount of metatheoretical work being done to make explicit the assumptions according to which research (one's own or others') is carried out. This kind of thinking is hardly new to speech perception research of course - *viz.* the long-standing debate over articulatory versus acoustic description; and the "object of perception" (Öhman 1975) - but it has certainly increased greatly in both quantity and quality in recent years. Some work is being done to tidy up terminological inconsistencies (Frauenfelder and Tyler 1987) to make a framework in which results are more commensurable.

The second part of the question, then, concerns whether, given all these issues, IP is basically on the right track, or whether some major revision or reorientation is required. This question, like all the others, is answered differently by different groups. Some - the topic of the review above - continue to work within the IP framework, attempting to maintain high standards of control and rigour, and making (relatively minor) theoretical adjustments as needed. For example, several parts of the discussion of issues, above, ended by reporting some suggestion for changing the formulation of a question addressed by IP. This of course contributes to the feeling of lack of unity - at least for the short term. Some researchers have taken on the responsibility of outlining in some detail the broad framework within which their own research will be conducted as a preliminary to embarking upon a better-integrated programme of empirical work. This usually involves some changes from the "standard" IP view. Examples are Massaro (1987), McNeill (1987).

Others are led by their metatheoretical questioning to break away from the IP model, using the analysis of IP's "pretheoretical assumptions" as a springboard to launch an alternative approach, defined in relation to a "standard" or "establishment" IP approach, and claiming to be based on more acceptable underlying assumptions, and thus to raise a different set of empirical questions. I will briefly discuss two[37] such approaches that are currently gaining an increasing following among those interested in speech perception.

1.8. Two Emerging Alternatives To The IP Approach

1.8.1. Parallel Distributed Processing

Thd first of these rivals to IP is the Parallel Distributed Processing approach - "PDP", or "connectionism" (see for example Elman and McClelland 1984, McClelland and Elman 1986, Rumelhart and McClelland 1986). In its view of the overall goal of speech perception, PDP is similar to IP, seeing the task involved as the achievement of matchable or canonical forms from the speech input: perception is thus, as in IP, a process of forming representations of a stimulus. The differences between IP and PDP lie in their understanding of how this is achieved[38]. In particular, PDP is opposed to the serial, modular, symbolic processing of IP, which is considered implausible as a mechanism for human perception. Though the moves towards more interactive processing in IP are appreciated by PDP researchers, they believe that a more radical change is necessary. The alternative proposed is related to the neurally-inspired AI models of Rosenblatt and others, which enjoyed a period of favour in the 1960s.

PDP proposes a mechanism consisting of a very large number of maximally simple units - each with only two possible states - massively interconnected by links which can either inhibit or excite activation of the units (nodes) they connect to. These nodes are arranged in a series of tiers or levels. Input takes the form of excitation of a set of nodes, which causes other nodes to be activated in patterns according to whether they are connected by inhibitory or excitatory links, and the strengths of those connections. An important feature is that the strengths of links can change according to the kinds of input the system regularly gets - in other words the system can learn to associate inputs with patterns of activation.

The current versions of such a model of speech perception (*eg* McClelland and Elman 1986) have the nodes arranged in tiers corresponding to linguistic units of the level of feature (based on Jakobsonian Distinctive Features, but scalar, rather than binary), phoneme and word. Nodes within a level are connected by inhibitory links, whereas nodes between levels

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[37]These are not the only existing alternatives to IP. However, the others of which I am aware (notably Rommetveit 1968) do not address the problems of speech perception as understood here, so I will limit consideration to these two.

[38]PDP is thus best seen as a technological innovation, though it does have some conceptual or philosophical concommitants. The philosophical framework as such will be discussed later (Chapter 4), so here I will comment only on the aspects that are related to speech perception.

are connected by excitatory links. Input to the system takes the form of stimulation of feature-level nodes by a speech wave, and activation of these units then spreads, according to the connection characteristics, to other nodes at all three levels. Nodes at other levels then, in their turn, excite or inhibit connected units, and information is thus fed back and forth between levels. As more of the speech signal is input, different patterns of activation emerge. Whereas at first, probably several units at word level were activated, as more information becomes available, some of these will receive more and some less activation. When one set of nodes remains clearly more active than any others, the word they represent is recognised, and its meaning can be accessed.

The advantage of such a system over the modular one, it is claimed, is that perception can be seen as a process of simultaneous constraint satisfaction, rather than as a series of discrete decisions. Speech perception can therefore be a highly interactive process[39], with information from different levels all being relevant at once[40]. Such models therefore demonstrate a mechanism for integrating bottom-up and top-down processing, and allowing both right and left context effects to be relevant to any percept.

> "Feedback allows higher level considerations to influence the outcome of processing at lower levels in just the same way that lower level considerations influence the outcome of processing at higher levels. The influences of lexical and other constraints on phoneme identification need not be pushed out of the theory of speech perception itself into decision processes, but are integrated directly into the perceptual process in a unified way ... no special provision needs to be made for combining lexical and phonetic outputs in the decision mechanism." (McClelland and Elman 1986:74)

Since all information is represented uniformly, explicit propositional knowledge is not needed. Rather the knowledge of the system is implicitly embodied in the strengths of the connections between its nodes. In fact the whole distinction between representation and processing is blurred, with the emphasis taken away from explicit knowledge and rules. Learning becomes not the addition of, or change to, rules, but depends on the changing weights of connections between nodes. In fact, such a system learns associations or regularities not explicitly given in the design. Similarly, the kinds of degradation such a system suffers on damage or error in nodes and links, or with poor quality input, is much more like that observed in human performance: compensations can be made rather gracefully and large degree of degradation can be tolerated without breakdown.

An important advantage claimed for such a model in comparison with IP models is that the system does not require, or even lead one to expect, invariant features of the speech signal. Rather than being a hindrance to perception, as it is in almost all IP formulations, the contextual variability of segments in the speech wave can be seen as a source of information for the hearer.

> "We maintain that the difficulty that speech perception presents is not how to reconstruct an

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[39]Models based on this approach are often called "interactive activation models; the best-known speech perception model so far is called TRACE.

[40]These systems can thus be seen as an extension of the thinking of Morton and Marslen-Wilson, or of the architecture of the HEARSAY system in the ARPA project. The PDP team explicitly mention these relationships.

> impoverished signal; it is how to cope with the tremendous amount of information that is, to use the term proposed by Liberman et al 1976, "highly encoded". (Elman and McClelland 1984:344)

The PDP view, it is claimed, allows a neat account of various well-known phenomena of human speech perception. For example, "real word effects" and the ability of subjects to use phonotactic information in constraining perception. Both of these effects simply "fall out" of the design of the PDP model, without requiring explicit representation of knowledge and rules for its application. Similarly, the way the links are arranged - inhibitory within levels and excitatory between levels - means that the system displays a kind of categorical perception, again without the need to postulate any "special" mechanisms.

At the current stage of development, there are also several problems associated with these models - though their proponents are confident that these are problems related to particular implementations, rather than being inherent to interactive activation models as a class. A great deal of developmental research is currently in progress. Here I will mention a couple of examples (taken from McClelland and Elman 1986) of the kinds of problems faced.

One is that of word boundaries: a given stretch of speech can contain many words other than the ones intended, especially long words can be made up of several smaller ones. Current PDP models of speech perception frequently "recognise" the wrong ones. Relatedly, it is sometimes necessary for a perceptual system to "recognise" non-words. It would seem then that some kind of control mechanism would have to be built in, incorporating decision processes which could use information at word level to locate word-initial phonemes (McClelland and Elman 1986:76). Another area of difficulty is that the overall pattern of activation can be quite different for different occurrences of the same word. These systems therefore do not mimic the well-known human speech perception phenomenon of "priming" - in which a second occurrence of the same or a related word is recognised more easily or quickly than the first. McClelland and Elman therefore suggest that it might be necessary to "have things both ways", using the TRACE architecture for recognition but also having a central store with a single representation for each phoneme or word.

The reaction from the IP community to PDP models is generally favourable, and the idea behind the architecture seems attractive to IP modellers as a way of achieving the kind of "parallel processing" widely thought to underlie speech perceptual abilities. However there is considerable doubt as to whether such non-modular models could ever be constrained sufficiently to deal with free connected speech. I will say more about this approach, as already mentioned, in Chapters 4 and 5.

1.8.2. Ecological Perception

The second rival to IP is an approach to speech deriving from the "Ecological" perceptual theory of J.J. Gibson (1966, 1979), a psychologist who developed a framework for studying perception based on what he called a Direct Realist philosophy. I will delay discussion of the more philosophical background till a more appropriate place, and concentrate here on how it has been used in speech perception research. Currently, the development of an ecological theory of speech perception is mostly associated with the name of Carol Fowler (*eg* 1986). Previously,Gibson's approach has also been adopted and adapted (though to a lesser extent) by, for example, Neisser (1976), Sanders(1977).

As in PDP, the major objection Direct Perception (DP) raises against IP is the amount of processing that it requires to be performed on the input to achieve a matchable form that can be used to access the meaning. The solution in this case however is not to propose a different mechanism but to question the underlying conception of human speech perception from which the processing view arises. It is seen to be related to a larger issue in perceptual theory: the postulation of intermediate representations between the stimulus and the percept, and it is the need for this postulation that DP theorists question.

They believe it is possible to avoid these intermediate representations and thus have a theory of direct (as opposed to mediated or indirect) perception. The key to this lies in the description of the stimulus. According to DP, IP's reliance on intermediate representations is necessitated by the fact that the description of the stimulus is described in the language of physics, and, further, that it is described as if it occurred in discrete time slices. DP prefers a more "ecological" principle for stimulus description: it should be relative not to scientific knowledge, but to the perceiving organism and its needs. Thus for an animal in a particular environmental niche, the stimulus must be described according to the ecological significance it affords - *ie* as food, shelter, danger and so on. As well, it is not the case that animals receive information from the environment in short static individual time segments. Rather a stimulus is spread out over time - it is an *event* - and its changing characteristics are part of the information available to the organism.

Adapting this approach to speech perception, DP's first step is to determine what is the object of perception from the point of view of the perceiver. This is taken to be not, as in IP, the acoustic waveform, but rather the articulatory origin of that waveform[41]. The acoustic wave, on this view, is simply the medium by which information about articulation is received.

The next step is the claim that the hearer can *directly* pick up information specifying the original articulatory gestures, and thus retrieve the speaker's meaning. There is no need for

[41]DP thus bears some resemblance to Motor Theory in its focus on the articulatory origin of the speech wave as opposed to its acoustic nature. In fact, some of the original proponents of Motor Theory seem attracted to the DP perspective (Studdert-Kennedy 1985, Liberman and Mattingly 1985).

processing, computation, knowledge application, and so on. This is to make the claim, then, that there is some direct relationship between articulatory gesture and linguistic unit: that it is possible to specify unique, invariant, lawful relations between articulatory gestures and linguistic units. As Gibson himself said[42] (1966:94) "Phonemes are in the air". The failure of the past thirty years' research to identify invariant relationships between *acoustic* and linguistic units is not felt to counter this claim; in fact, from the perspective of DP, it is not surprising that the search has been unsuccessful, since it has been seeking the wrong goal - segmentation of an acoustic, rather than articulatory, representation.

Even so, this DP claim is a fairly substantial and controversial one. Proponents of the theory believe it can be fulfilled by attention to speech production theory. They favour the view embodied in Action Theory (*cf* Fowler et al 1980), which stresses that production should be thought of not as "translation" of phonemes or other units into deformed images of themselves contaminated by the influence of adjacent sounds. Rather it should be seen as a series of skilfully controlled and coordinated gestures, emphasising that these are *events* taking place in time. Coarticulatory effects, then, are not a hindrance to perception, but a rich source of information about the exact nature of the gestures that were performed. Speech is thus a sequence of overlapping gestures of the vocal tract, not a series of mutilated phonetic segments. The DP view also encourages conception of speech perception as an integrated process involving the entire perceptual system, not one isolated mechanism among others. Researchers prefer to focus on the perceiving subject as actively integrating and seeking information from a variety of sources (*eg* Byrnes 1982).

This view of speech perception has attracted a considerable amount of interest, and is supported by a number of experiments and reinterpretations. It is clearly in early developmental stages however, and there is still a good deal of debate at the level of theoretical possibilities. In general the IP community welcomes[43] the attempt to do some metatheoretical sorting out, and accepts some of the criticisms brought against it, especially those to do with the standard descriptions of the speechwave as "impoverished", and the implausibility of "translation" theories in their most blatant forms. The term "ecological" has entered the IP vocabulary, especially with respect to the kinds of experimental investigations that should be used in studying speech perception. However there are also some strong reservations about the plausibility of the alternative. It is especially doubted whether there really are invariant relations between articulation and linguistic units. Perhaps the major concern of IP theorists is over the lack of any top-down processes, which IP sees as necessary to overcome poor signal information and account for the many context effects and ambiguity resolution in speech perception; and as being evidenced by the occurrence of errors of perception.

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[42] *Cf* Fowler (1986:13): "The perceived parsing must be in the signal; the special role of the preceptual system is not to create it but only to select it."

[43] See responses to Fowler (1986).

1.9. Conclusion

Now that I have reviewed the IP approach to speech perception, and given, I hope, a fair appraisal of its strengths and weaknesses in the eyes of its practitioners, I can step back a little to state my own opinion of it, which is in fact the motivation for the research undertaken in this thesis.

I am struck particularly by two general features of IP research as reviewed above. The first is that in taking a fairly broad survey of the field, it turns out that almost every aspect of the basic IP model is criticised or doubted by some subsection of the community. This was seen above, where the diversity of opinion on several key topics was pointed out: the relationship between active and passive processing, the existence and relevance of invariant cues, the number and interactiveness of modules, the question of units of processing, and so on. Many sections included mention of some more radical suggestion of a need for reformulation of the basic questions to which answers have traditionally been sought: maybe we should not think in terms of concatenated units, or acoustic cues, or stages of processing. This continual requestioning of basic principles seems to me to be a significant hindrance to progress in speech perception research. The solution is certainly not to discourage such questioning; but rather to undertake a thorough analysis of the issues and the general criteria according to which the various positions are held and defended. If so much is being questioned, it must surely be relevant to ask what exactly it is about the IP model that is being retained, and why.

My second observation is that, while it is surely true that the research reviewed above constitutes a large body of knowledge about various phenomena of human speech perception, it is not clear that what is being offered is an account of speech perception *in general*. Certainly IP has been successful in providing a theory to relate signal characteristics and percept in a range of cases. But the attempt to extend this account to cover more general kinds of cases, notably everyday perception of speech in conversational situations, runs into severe problems. If an account of some human activity has difficulty with notions of control, context, meaning, individual differences, integration, and so on, it must be legitimate to wonder just what about that human activity it is explaining. What is wrong here is not the account that IP gives, but the fact that there is an inadequate appreciation of the scope and range of that account, and the principles according to which it can be generalised. Here again, then, the need is raised for consideration of criteria and presuppositions.

I have already shown that there is in fact a good deal of metatheoretical research being carried out within IP. My belief however is that there remains scope for considerably wider and deeper analysis than is currently being undertaken. Current discussions usually start from a statement of the basic IP assumptions, in conjunction with some well-accepted observation, and derive some conclusion according to which further practical work should be carried out. This is a well known and often successful procedure. It has the disadvantage in this case however that the basic IP assumptions as a whole are relatively little questioned

and justified. If it were aspects of the foundations of the model that were causing the problems being addressed, this approach would not uncover them. It would be rather a form of symptom treatment. If different researchers focussed on different symptoms, it would lead to a wide range of different solutions, and a generally ununified field of research - which is in fact precisely the status of IP at the moment, in not only my view, but that of many IP researchers.

In my opinion, the current state of IP is a result of the pattern of its development: progressively extending an account of some observed relationships between acoustic features and perception of phonemes, syllables, or other speech sounds, into a theory of speech perception in general has meant that little attention has been paid to the question of how or whether the account relates to what human beings are like (as opposed to what an acoustic representation of speech sounds is like). In fact, to foreshadow my conclusion, I believe that the IP model is inadequate precisely because it presupposes a processing system which is not a possible description of a human being as a perceiver of speech.

There is, I suggest, an alternative approach - of starting with an understanding of the nature of human beings and human cognition in general, and then narrowing the focus to account for speech perception in terms of the more general principles. This, in the most general terms, is the kind of approach I will recommend in the last chapter of this thesis.

To be able to do that requires an analysis, not, in the first instance, of the IP theory, but of the framework of assumptions according to which it is defined. The following chapter, then, sets out the main features of the philosophical background of IP, which will be analysed in Chapters 3 and 4. Finally, I will bring the discussion back to the level of speech perception theory in Chapter 5. The result of the analysis I am conducting will not be solutions to the problems of IP as posed within IP, but rather, I hope, some insight into particular ways in which the questions IP seeks to answer are ill-formulated, and increased understanding of the principles according to which they ought to be re-posed.

Chapter 2

COGNITIVIST PHILOSOPHY

2.1. Introduction

Having given a review of IP research on human speech perception, and stated a need for consideration of the philosophical or metatheoretical framework within which this work is carried out, I would like next to set out exactly what that framework is, as a basis for discussion of the issues I believe to be significant. This unfortunately is not a straightforward task. The framework is not predefined, and as has already been seen, there is considerable diversity in the metatheoretical approaches taken by IP researchers.

However, it is not entirely a matter of piecing together the metatheoretical orientation from clues in the theory. As already mentioned, IP emerged as part of the development of cognitive science. Cognitive science also includes another branch specifically concerned with matters of philosophy related to its overall enterprise. Much of the metatheoretical framework of individual fields in cognitive science is set out explicitly by philosophers in this branch, sometimes called "cognitivist philosophy", or "cognitivism" (*cf* Costall and Still 1987). It is not quite acceptable, though, simply to use cognitivist philosophy as a statement of IP's metatheoretical commitments. For one thing its scope is too wide, since it interacts to a great extent with other Anglo-American philosophies, and is rather difficult to separate distinctly from them. Many of these concerns are not at all relevant to the argument of this thesis. As well, cognitive science is a large field, rapidly expanding in both size and complexity. Not only would it be impossible to do justice to the range, diversity and sophistication of all its philosophical issues and arguments in single chapter, it would be too general for present purposes, which require discussion of only a subset of these issues. Finally, the metatheory of speech perception research is not identical with that of other branches of cognitive science. It has been seen already that many psycholinguists (and other psychologists) have been doing metatheoretical analyses of their discipline. In some cases (*eg* the issue of the relationship of psychology to AI or linguistics) there can be divergence between philosophical analyses by cognitive *psychologists* and cognitive *scientists*.

Despite these problems of definition, however, I believe it is possible, by judiciously drawing on work in cognitivist philosophy and cognitive psychology metatheory, to identify a philosophical position[1] which is used as an explicit statement and justification of the IP framework. The present chapter will be devoted to the description and criticism of that philosophical position. When I use the terms "cognitivist" or "cognitivism" therefore I shall be using them in this slightly restricted sense.

As in Chapter 1, my aim is to set out the central well-agreed tenets of the approach, and give an overall impression of the flavour or style of the arguments that go on around them, so I make no claims to exhaustive coverage of all the details. It will be seen in following chapters that the level at which I wish to disagree with cognitivist philosophy is one at which details of differences between researchers are often not so relevant as their similarities.

The structure of the chapter is also similar to that of Chapter 1: it sets out first the central tenets of cognitivist philosophy; then some aspects of the framework that is elaborated around these tenets; and then some of the empirical and conceptual issues and debates that arise within cognitive philosophy. Finally, in a discussion section, it points to the factors, inherent in the framework, which I believe are at the root of my dissatisfaction with IP as an approach to speech perception research. Chief among these, as already foreshadowed, is the nature of the Subject[2] presupposed by the theory. I will be arguing that a Subject performing only the kinds of processes described by IP could not be a language-user in the full human sense of the word.

2.2. Central Tenets of Cognitivist Philosophy

2.2.1. Monism

Perhaps the most important criterion that any philosophy of the twentieth century has to fulfil is that of having a **monist** ontology: it should postulate only material entities, and not rely on any non-material elements in its explanations and descriptions. One of the great advantages that cognitive science claims for itself is that it fulfils this criterion, while avoiding the opposite trap of reductionism, and consequent inability to account for complex or intelligent behaviour. Cognitivist philosophy thus defines itself as steering a middle course between unscientific dualism and mechanistic behaviourism, seen as two equally undesirable extreme philosophical possibilities. Its ability to provide this way out between the horns of a dilemma

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[1] *Cf* similar conclusions reached by Mandler (1985:11), Kintsch et al (1984), Eysenck (1984:1ff). Some discussion of the status of cognitive science as a unified discipline will be given in Sec. 2.5 below.

[2] Until now I have been using the word "subject" in the usual psychological sense of the subject in an experiment, about whom theoretical claims are being made. It will be convenient from now on to broaden the sense of the word to incorporate the characteristics of any perceiving or cognising agent. (Much more will be made of this in Chapters 3, 4 and 5.) When I intend the word in this sense, I will capitalise it.

is felt to be an important achievement, and at the heart of cognitivist philosophy's self-definition[3].

The breakthrough that allowed cognitive science to achieve this middle course was the analogy it drew between mental processes and **computation** (*eg* Newell and Simon 1963). There are commonly[4] said to be three major components to this analogy, which I recapitulate briefly here.

2.2.2. Symbolic Representation

The power of the computer, in this context, comes from the fact that its operations can be seen as being performed on **symbols**, which can **represent** something other than themselves. Whatever computation is required, the elements of the situation are first symbolised, in a form the computer can use; then the symbols are processed according to some program, for which it is irrelevant whether the symbols represent milkbottles, middle-class families, or whatever; and the output symbols are interpreted in relation to the particular context in which the computation is being carried out.

Cognitive science suggests that human cognition works in a similar way, *ie* that minds are "physical symbol systems".

> "At the root of intelligence are symbols, with their denotative power and susceptibility to manipulation." (Simon 1981:14)

This suggestion has some important advantages in explaining human cognition. Since the symbols are material entities, monism is maintained - they and the processes that are performed on them obey the well-known laws of physics, logic and mathematics, even though the symbols can represent anything at all, even non-material entities.

> "... formal tokens can lead two lives: *syntactic* (formal) *lives*, in which they are meaningless markers, moved according to the rules of some self-contained game; and (if the system is interpreted) *semantic lives*, in which they have meanings and significant relationships to the outside world. The story of how these two lives get together is the foundation of modern mathematics and logic; and it is also the philosophical inspiration of cognitive science." (Haugeland 1981:22 his emphasis)

It is important to emphasise the feature of this computational analogy that gives it its great power. The notion that human cognition involves the ability to represent objects of the world is hardly new to philosophy. Cognitivist philosophy differs from previous versions in the nature of the things it claims can be represented by physical symbols. These can include not just features of the world, but knowledge, propositions, goals, desires, and many other things

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[3]Indeed, it is common in debates among cognitive scientists for the opponents to accuse each other of regressing towards one or other of those endpoints. A good example is Dennett and Searle's (1982) debate.

[4]In much of the following account, I will be putting forward well-accepted and frequently rehearsed views. General accounts similar to the one given here, though often differing in emphasis or selection, can be found for example in Stillings *et al* (1987); Anderson (1985); Sanford (1987); Eysenck (1984); Lachman, Lachman and Butterfield (1979).

that need to be taken into account in intelligent behaviour. All of these can be represented in the same kinds of symbols, which can then all interact in the computational processing. Thus, all that is being postulated ontologically are material entities (and monism is maintained);but, since the symbols can represent beliefs, meanings, goals and so on, the system can show highly intelligent, knowledge-based behaviour (and reductionism is avoided).

In effect what is being claimed is that there is a "level of description" - the symbolic - between the two *observable* levels of a person - the behavioural and the physical (or neurological) (*eg* Gardner 1985:383); and that understanding of this third level is necessary to understanding of the functioning of the cognitive system (at least until we have a far better understanding of neurology than we do now). The analogy is sometimes drawn between this situation and that of computer descriptions: explanation of the computer's behaviour in terms of its low level descriptions - flow of current through switches, or machine languages - is not always the most appropriate. For many purposes, it is more useful to give explanations on another level, such as the level of programs and programming languages. Moving between the levels is justified, in the case of the computer, by the fact that the relationship of the levels is known: translation from one description to another is possible in principle. In the case of human descriptions, we are not yet sure in detail of how the levels relate to one another; but the example of the computer showed how the (unobservable) mental could be included in a scientific, *ie* monist, psychology.

2.2.3. Processing by Rules

Cognition, in cognitivism, is not about static representations. Another key concept of cognitivist philosophy is that the mental symbols can be **transformed** before being interpreted. Repesentations are **processed** according to computational rules which can act automatically on specifiable features of the symbolic representation - the specification of these features might be very complex, and require reference to knowledge represented elsewhere in the system, but it can be done relative to features of the representation, rather than features of whatever it represents. In other words, the operations are **formal**[5]. But, since the symbols are in themselves not tied to a particular meaning, the processes they undergo can be very general, or abstract; thus of general purpose, but unmysterious.

> "Computation is the only worked-out view of *process* that is both compatible with a materialist view of how a process is realised and that attributes the behaviour of the process to the operation of rules upon representations." (Pylyshyn 1980:113)

Again, it was the advent of the programmable computer which demonstrated that highly complex and flexible behaviour can be achieved by a system using only formal rules: though each individual step of a process might be maximally simple, a large number of such steps acting together, and able to make use of knowledge, plans, etc, symbolised in the system,

[5]Some difficulties with this view will be discussed below.

can create extremely complex effects. The Turing machine was the theoretical demonstration of this point.

Intelligent processes could thus be thought of as the operation of a formal system: a set of tokens and the rules for their manipulation or transformation.

2.2.4. Functionalism

An important, though somehow ironic, consequence of the fact that the physical symbol system need not have any necessary relationship to the meaningful interpretation of the symbols, is that the actual physical material the representation is made of is irrelevant. Whatever the symbols are made of, so long as the functional relations between them are maintained, and the appropriate computation is performed, the output can be interpreted as the appropriate result of the computation. Thus, the functional relations between the representations are more important than their physical properties. Everything is defined by its function in the system rather than by its physical properties. This fact lifts the whole discussion into the realm of the abstract: what matters are abstract functional relations, rather than whatever particular physical material might instantiate those relations.

This perspective allows an account of why it is that things which share no physical properties can still be in a sense "the same". The classic example is the sameness of a wind-up clock, a digital watch and a sundial all registering the time "10am": though there is nothing physical about them that is the same, they are all in the same "functional state".

> "Mental things, like beliefs, images and thoughts, are what they are because of what they represent. They represent what they represent because of how they behave in the mind. The point is that very different kinds of things ... could all represent the same thing." (Stillings et al 1987:306)

On this analogy, the human cognitive system is simply one among many possible instantiations of intelligent processes; biological systems (such as human beings) are just one class of intelligent machines. This is the reason that neurology is[6] of secondary interest to cognitive science.

This feature of cognitive philosophy is extremely important for practical work in cognitive science. Its task can now be seen as that of determining the abstract program(s) that any human cognitive process instantiates - *ie* the interest is in the software more than the hardware. Since it is the functional, and not the physical, properties of the program that are relevant[7], it is legitimate to study cognition using models whose physical and computational properties are understood far better than the brain's. Thus, Artificial Intelligence (AI) is a central area of cognitive science; and computational modelling of (subsets of) human cognitive abilities one of the main avenues of theory development.

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[6]Or "has been" - see below.

[7]Physical properties are of course relevant in the sense that whatever program is postulated must be able to run in the hardware of the brain.

2.3. Philosophical Framework

2.3.1. Introduction

Around these three basic tenets (representations, processing and functionalism) is elaborated a philosophical framework within which cognitivist answers to various philosophical questions can be given. In this section, as in the analogous section of Chapter 1, I present what might be thought of as a "core", or unembellished account of this framework. Not all cognitive scientists would unqualifiedly accept all of them. The issues and debates which occur within cognitivist philosophy around these points will be brought out in the next section. This is approximately the way cognitive philosophy has developed historically - the earlier a theory is, the more likely it is to fit the description in the first section. Most of the issues raised in the second section arise in response to specific failings of the "core" account, and are therefore easier to expound with respect to it.

I mention firstly some aspects of cognitivist philosophy's framework relevant to the characterisation of the human being (Subject); secondly, aspects relevant to the characterisation of science and scientific method. Most of this is rather familiar material, and this section is intended more to make explicit the starting point for further discussion, than as an exhaustive treatment[8].

2.3.2. Characterisation of Cognition

2.3.2.1. Knowledge

Cognitivist philosophy, as has been noted several times, is keen to stress the degree to which human mental processes depend on knowledge, in contrast to behaviourism, which tried to do without any such concepts in its account of human action. Given the view of cognition I have just outlined it is natural[9] to assume that everything a person knows that will be relevant in any cognitive process is represented symbolically, and stored so as to be available to interact with other symbolic representations. The form of such representations - *eg* whether they are images or propositions - and their nature - *eg* what terms and syntax they are in - are then topics of research in cognitive science.

The amounts of knowledge typically stored by a person are of course enormous, and issues of the organisation and retrieval of particular items from vast databases are also key areas of empirical research. Human memory is generally assumed to be divided into three stores of varying durations: long term memory, working memory and very brief sensory registers of

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[8]Again, similar accounts can be found in many textbooks and reviews, *eg* Anderson (1985) Eysenck (1984) Stillings et al (1987)

[9]Problems with this view will be brought out below.

various kinds[10]. The storage capacities of each of these, and aspects of forgetting and access are important areas of investigation. Memory is often thought to be organised according to "schema" or "script", with slots for particular items to be filled in, which allows the concept of "default" entries to be used in accounting for the way people can infer information not explicitly given in a text.

2.3.2.2. Thinking and Intelligence

The paradigm of intelligent thinking has been considered by cognitivist philosophy to be "problem-solving". This involves definition of a problem state and a goal state. Intelligent problem-solving is considered to involve setting of sub-goals, and decision as to the most efficient logical path between them. (*cf* "Towers of Hanoi" and other such puzzles). Learning and reasoning are thus at the heart of cognition - in contrast with a behaviourist account, which allows only trial and error and reinforcement to affect the organism's response to problems. This kind of human intelligence or rationality is often said to have evolved as an aid to survival.

An early difficulty with this view was that of the "combinatorial explosion" that occurred with complex problems if every logically possible route had to be tested. Also, in real-life problems it is not always possible to specify the goal in advance, so routes cannot be enumerated and compared. Considerations such as these led to the development of concepts like "heuristic"[11] and "strategy" - procedures based on "educated guesses" which, though not infallible, work in the normal case to reduce the amount of time and effort expended in a search.

2.3.2.3. Perception

A good example of the role of knowledge and reasoning in cognitive theory is given by the treatment of perception. Perception is seen[12] as the extraction of information from a stimulus, usually described in physical terms, which impinges on the sense organs. It is often explained that the simplest or most obvious account of perception would be as template-matching - as in behaviourism - but that this could not work because of the degree of contextual variability in the stimulus. A better account therefore is to think of perception as pattern-recognition, involving knowledge-based transformation through stages, of the kind discussed in Chapter 1 for speech perception.

The first stage of pattern-recognition is feature-extraction and -representation. Once the

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[10] *Cf* Section 1.3.2 above.

[11] As opposed to *algorithm*.

[12] The example of speech perception was of course treated in detail in Chapter 1, but very similar considerations apply in, say, visual perception: "The central theoretical problem in object-recognition ... is to explain how abstract representations of visual categories in long term memory (LTM) can be rapidly retrieved ... by the information present in low- or intermediate-level representations of visual input." (Stillings et al 1987:492)

information-bearing features have been extracted from the stimulus, they must be organised, and combined, through several stages of processing, with information from knowledge representations stored in memory. Thus perception involves both top-down and bottom-up processing, as evidenced by the occurrence of errors, illusions and ambiguities. For recognition to occur, the outcome of all the processing must be a form, or abstract pattern, which can be matched with a semantic representation stored in long term memory[13].

2.3.2.4. Language

Language is one of cognitive science's most important areas of study, since its use gives a window onto the structures and processes of the mind: given the structure of language and the fact that it is understood, we can see the kinds of inferences and knowledge application which form the core of the cognitive system. Also, language is involved in many high-level cognitive processes using categorisation or conceptualisation. Lastly, language has been a key topic of Anglo-American philosophy in the twentieth century, and there has been considerable cross-fertilisation between cognitive science and philosophy since the beginning of cognitive science.

Chomskyan linguistics was very important in the development of cognitivist philosophy, especially his arguments against structuralist/behaviourist accounts of language and language use (Chomsky 1959). Chomsky's transformational-generative view of language as a rule-governed system, rather than a set of static structures; his focus on sentences and their relationships (especially their ambiguities) rather than phonemes and theirs; and his demand for a new standard of "explanatory adequacy" were influential to the degree of being revolutionary. It was partly through his work that the common concerns of linguistics, psychology and computer science were highlighted. Compared to the early days, however, "the honeymoon is over" (Lachman, Lachman and Butterfield 1979): the relationship between linguistics and psycholinguistics has become much more contentious since the 1960s. Nevertheless, many aspects of the Chomskyan conception of language and language use remain[14], at least in core areas of cognitive science. The separation of competence and performance clearly fits in very well with cognitivist philosophy, as does the focus on formal structures and rules. Also Chomsky's observations about the ambiguities and other relationships of linguistic structures have posed some of the defining problems for cognitive science.

> "For the most part ... Chomsky has been more influential in psycholinguistics because of the kinds of questions to which he has drawn attention than because of any direct utility of his theory for experimentation." (Gardner 1985:215)

Language is seen by cognitivists as a system of relationships between physical forms and

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[13]A very similar account to this one is given by Eysenck (1984:38).

[14]The idea of the relationship between language, psychology and philosophy in itself, of course, shows the influence of Chomsky's thought.

meanings[15]. In general the meaning of a word or sentence is thought of as a semantic representation associated with it. Both the formal and the semantic properties of language are important areas of study. The formal representations are studied for the rules of their relationships (syntax). The semantic representations can be studied in their own right, and decomposed into their elements to find the relations they have with each other - often thought to be in the form of systems or networks. They can also be studied for their relationship to thought itself. In general, thought is not considered to be identical with the use of language. Rather, linguistic forms cause or affect thought processes that take place in some other, perhaps language-like (Fodor 1975), system of conceptual representation.

> "Words manipulate mechanisms of thought and thought processes select the words we utter but words themselves are only sounds or shapes which interact with mental procedures." (Sanford 1987:18)

This view is motivated, for example, by the observation that people's memory of something they have learned through language is usually in terms of its semantic interpretation, rather than the linguistic structures which actually encoded the information.

The relation of linguistic structures to facts about the world is another topic of interest to cognitivist philosophy. A particular focus is on how to characterise the truth values of statements in terms of their relationship to the truth or falsity of the facts they represent.

2.3.3. Characterisation of Science

2.3.3.1. Relationship of Science to Philosophy

One of the hallmarks of cognitive science is its interdisciplinary nature. From the beginning it has been felt that the new conception of cognition allows many questions that previously were open only to philosophical speculation to be given a scientific or empirical cast: the framework constrains speculation; and experimental tests can provide answers to the (reformulated) questions. This has been seen as very much a parallel of the historical development of the special sciences from a general, speculative philosophy (Miller and Gazzaniga 1984:4).

However, in the last decade, especially, the relevance of philosophical thought to empirical issues, rather than *vice versa*, has been given increasing emphasis. The failure of the early AI models and theories of cognition is often blamed on conceptual confusions caused by an overly cavalier attitude to philosophical issues. One outcome of this has been that many cognitive scientists have taken an interest in philosophy themselves rather than leaving it all to the professionals (which is of course why much of the work I refer to in this chapter is by people who are primarily psychologists or computer scientists). It is increasingly common, for example, for cognitive psychologists and others to situate their work in a context of the history of philosophy.

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[15] "Language relates sound to meaning via syntactic structures." (Stillings *et al* 1987:389)

2.3.3.2. Truth and Explanation

In the early days of cognitive science, there was confidence in the cumulative nature of science and the attainability (by "convergence") of (closer and closer approximation to) the truth. Nowadays it is much more common to accept a Kuhnian view of scientific paradigms, consensual beliefs and pretheoretical assumptions, with "truth" being seen as relative to an agreed framework, rather than defined absolutely. Cognitivism thus provides the framework of assumptions within which empirical work can be carried out. Many cognitive scientists say that the cognitivist view is only one of many possible views, but that for the time being it is the most generally accepted and fruitful[16]. It is thus thought of as a "working hypothesis": it may turn out to be wrong, but in the meantime, much will have been learned. Given this view of science, the ability of cognitive science to make explicit its pretheoretical assumptions, and work rigorously from them, is often claimed as one of its advantages. As was seen in Chapter 1, the computational metaphor is often said to be an important aid in maintaining rigour and explicitness.

One of the prominent issues in the change from behaviourism to cognitivism was that of *explanation*, with the move from inductive to deductive demonstration, and from verification to falsification of hypotheses[17] [for an exposition of the older view of science and scientific method], bringing about an emphasis on *bold* conjectures and *fruitful* hypotheses. Provision of a working model or program is considered the best possible kind of explanatory demonstration; the potential of cognitive science to produce such real demonstrations of the validity of its theories is considered one of its major advantages.

> "...if computational concepts can be embodied in a functioning computer program that can be run on a machine, then one *knows* that the programmed theory in question is sufficiently powerful to generate the performance evinced by the machine" whereas "The explanatory power of verbally expressed theories is ... intuitively sensed rather than rigorously articulated..." (Boden 1979:115, her emphasis)

This goal however, is a very advanced one, and not always practicable[18]. For many purposes a more informal view of explanation is usually accepted. A model is deemed "explanatory" if it allows control or at least prediction of the phenomenon under consideration, and especially if it can account for more observations than it was originally devised for; or if it relates something we do not understand (in the case of cognitive philosophy, for example, human intelligence) to something we do (for cognitive philosophy, this means for example, computers, biology, or physics).

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[16]Several modern textbooks actually introduce cognitive science in this way. One example is Lachman, Lachman and Butterfield (1979).

[17]See Cohen and Nagel (1934)

[18]In any case, some cognitive psychologists now question the validity of such demonstration - see below.

2.3.3.3. Scientific Method

The topic of method was discussed with respect to psycholinguistics in some depth in Chapter 1. It is also a topic of concern in cognitive psychology more generally (*viz.* Kintsch et al 1984). Very much the same kinds of issues are raised, especially the difficulties of designing and interpreting experiments about unobservable mental processes.

It is generally accepted that the basic sequence of formulation and experimental testing of hypotheses arising from theories is the right one, but many problems with it are discussed. For example, it has often been the case that the more obviously programmable aspects of cognition have been tackled first, leaving more difficult ones aside. While this procedure is agreed to make sense in general it is sometimes criticised on the grounds that the tasks that are "simple" computationally are not always those that are "simple" for humans. Jenkins (1974) wonders if it might not be like thinking it is "simpler" to ride a monocycle than a bicycle, and a bicycle than a cart. This is part of a general difficulty of defining sub-goals for research which make sense in relation to the more distant major goals (Miller and Gazzaniga 1984:9).

It is also usually agreed that development of well-specified, general theories is desirable; but this criterion also has its problems. Aiming for increasingly well-specified models and theories can encourage the kind of "paradigm-driven experiments" described in Chapter 1. Aiming for very general models can mean that sources of variability are eliminated, by careful selection of subjects, absolutely uniform conditions, etc, when the variability might itself be significant (Cohen 1977 discusses these points in some depth).

A major point often claimed in the favour of the cognitivist enterprise, as has been seen, is that it compels researchers to be explicit, and therefore more rigorous, in their thinking, especially by imposing the need for computational modeling. Again, there are some doubts as to how good a test a computer implementation is - in other words, the fact that a computer can "do it" cannot necessarily be taken as evidence that humans "do it" in the same way. (This point, as well as some of the others raised here will be taken up again below in Sec. 2.4.)

In general cognitive scientists are very aware - as was seen to be true of speech perception researchers specifically in Sec. 1.4.2 - of methodological problems, and currently there is increasing interest in designing experiments with "ecological validity" (the term taken from Gibsonian theory already mentioned and discussed again below), as well as increasing concern with the need to be explicit about presuppositions, control of variables etc.

2.4. Issues Within Cognitivist Philosophy

2.4.1. Introduction

There are, naturally, many areas of debate within cognitivist philosophy. I will focus here on a few central ones that have particular relevance to the present thesis.

2.4.2. Consciousness

One of the biggest philosophical problems facing cognitivism is how to account for consciousness and conscious experience. Given the monist postulation that there is only one kind of entity, it is necessary to explain the fact that some entities of that kind have consciousness, while others, by hypothesis of the same kind, do not. This raises questions like: What is it about a thing that makes it conscious? How can we differentiate between the two theoretically? Is it possible to give consciousness to a non-conscious entity? Why are some human cognitive processes conscious while others are not? What function does consciousness serve?

> "The problem of consciousness lurks always in the background. The phenomenon of immediate awareness is a collection of unanswered questions. What does it mean for attention to be conscious? What limits unconscious information-processing? What is consciousness good for? Could computers be conscious? The questions go on and on." (Miller and Gazzaniga 1984:9)

The view that emerges from the standard cognitivist tenets outlined above is that consciousness, like other properties of systems, is a consequence of the functional relationships of representations and processes. On such a view, it is theoretically possible for a non-human, non-living[19] entity - a machine - to have consciousness. For some aspects of consciousness - like knowledge, beliefs, even hopes, desires or self-awareness - this is relatively uncontroversial. However, when it comes to the subjective, conscious experience, the "feel", of some states, the classic example being pain, it is admittedly harder to be convinced that a machine made of metal and wires could have "consciousness" in the same sense as we humans do.

There are various ways of treating this issue, of which I will mention only a couple. One is to insist that "pain", and other cognitive states, are a matter of the instantiation of a particular computational process or functional relationship. In humans, for example, this process is instantiated when particular nerve fibres are stimulated. Part of the process is the holding, by the system, of the belief that it is in pain. This view suggests that our unwillingness to attribute pain to a machine is mere prejudice on our part. If a machine instantiates the functional relations of pain, including having the belief that it is in pain, and asserts that it is in pain, who are we to deny it? Surely that would be the worst kind of inhumane prejudice?

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[19]Perhaps "non-carbon-based" is a less prejudiced term.

This view is backed up by various thought experiments involving the gradual replacement of a person's entire nervous system with an artificial substance that instantiated all the same functional relationships and carried out the same computational processes as the original. At what point could we say that the person no longer "really" felt pain? Or was no longer "really" conscious? (This line of thought is pursued to great effect in Hofstadter and Dennett 1981)

Others take less hard-line approaches that involve weakening the force of some of cognitivism's basic tenets. One such approach is to concede that there are aspects of human nature - pain, and perhaps other aspects of human experience, such as emotions - which are simply outside the scope of computational explanation. This would seem to be Boden's view - she makes the analogy between cognitive science and other scientific explanations:

> "One might well doubt whether biochemistry will ever be able to explain *all* the metabolic processes occurring within the human body - but it does not follow that biochemistry has nothing to say about these processes." (Boden 1979:113, her emphasis)

After all, she says (p.130), we do not expect chemical theories to fizz if we put them in a test tube.

> "Every metaphor or analogy has its limits, and the scientist should ideally know what these are. But it is not always possible to predict - or even sensible to ask - what these limits are at the early stages of employment of a theoretical metaphor in science." (Boden 1979:113)

Another response is to suggest that the tenet of functionalism has its limits. Consciousness can then be explained as a property of the particular (biological) matter that some intelligent systems are made of, and thus not transferrable to a machine made of metal and wires. Searle (*eg* 1981, 1984) is a particularly well-known holder of this view.

Another way that is hoped to afford insight into the problem of consciousness is to look at it from a philosophical or conceptual perspective, suggesting that it is the formulation of the problem itself that causes the trouble, and that it is therefore necessary to define more carefully exactly what is meant by the word "consciousness", which has many connotations, some rather emotional. One possibility is to speak not of conciousness but rather of attention. On this view, the difference between conscious processes and unconscious ones is that the former are attended to, while others are not. This is related to the observation that human cognitive systems have limitations on the capacities of their memory stores, which must therefore be used as efficiently as possible. "Consciousness" thus has, on this view, an adaptive function, both in allowing the system to reflect upon its own thought processes, and in limiting the amount of information that has to be dealt with at one time:

> "If one were aware (conscious) of *everything one knows*, or even of everything that is relevant (closely related to) some current experience, one would be swamped with information and unable to act." (Mandler 1985:82, his emphasis)

This gives a useful insight into the relation of the conscious to the sub- or unconscious as seen in cognitivism. Processes of which we are not conscious, or aware, are like conscious cognitive processes in kind; the difference is that they are either unattended (because the attention is focussed elsewhere) or not available to awareness (because they happen "below

the level of consciousness")[20].

A concept that has become increasingly important in this regard is that of "intentionality". It is a concept with quite a long and confused history, and will receive further discussion in chapters 3 and 4. In current cognitivist use it seems to have several possible definitions and uses. According to one of these, intentionality is "a philosophers' term for *aboutness*" (Stillings et al 1987:317) - *ie* the property of something that makes it possible for that thing to be *about* something else. An intentional state, for example, is one which has content as well as formal features and relationships. Key examples are beliefs, desires, fears, etc, which are all, necessarily, *of* or *about* some object ("object" being meant in a grammatical, rather than physical, sense).

Intentionality can also be defined as a property of systems or devices: an intentional system is one which operates on the basis of beliefs, goals, fears, desires, etc. As we have seen, operation which takes into account such factors is an important feature of intelligence in the cognitivist view. An intentional system is, thus, in a sense an "intelligent" system. Consciousness, intentionality and intelligence are thus all closely bound up together: the question of how if at all they differ is one of the currently focal issues in cognitivist philosophy.

The questions about consciousness are sometimes rephrased, then, in a more precise or scientific way, ("more neutrally" - Dennett 1978), in terms of intentionality, in the hope of avoiding some of the problematic connotations of the word "consciousness". The debate then concerns whether a machine could in fact have or be given this property, leaving out of consideration our more emotional feelings about souls and human dignity[21].

A problem remains however: that of defining when a system should be deemed to be intentional. One response to this, given for example by Pylyshyn, is that if the behaviour of the system can be altered in a general way by change of a specific intentional state, then it is intentional. In such cases, an explanation of the process needs to be in terms of the "functional architecture" of the system, rather than its electronic or physiological events. For instance, in humans, a change in one belief state can cause radical differences in behaviour. The fact that human behaviour is so well explained in everyday life by "folk psychological" descriptions[22], which are essentially intentional, argues, in his opinion, for the importance of intentional states in human behaviour.

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[20]To use the fact that we are not aware of this kind of processing going on inside our skulls as a counter-argument to cognitivist philosophy's claims is considered to be regressing to the old introspectionism. Observable and verifiable evidence is felt to be more reliable, and all the evidence shows that some such processing must be going on. "The processes are the same whether consciousness enters into it or not" (Sanford 1987).

[21]It has to be said that this has sometimes led the word "intentionality" to be used very loosely, as a convenient catch-all phrase, meaning something like "whatever it is about ourselves and our human consciousness that we are inclined to think could not be attributed to an artificially intelligent device".

[22]Everyday explanations such as "He went to town because he *wanted* to buy shoes"; "She left because she *knew* that the bus had come", and so on.

A more radical proposal, from Dennett (*eg* 1978), is that the "fact of the matter" as to whether or not a system operates with propositional attitudes is not relevant, even if it is ascertainable. He takes the instrumentalist position that if it is useful for explanatory purposes to ascribe beliefs to the system, then we should do so. This he calls taking the "intentional stance" towards a system. Searle, on the other hand, disagrees strongly with Dennett's position. He believes not only that there is a fact of the matter, but that it is a crucial matter. The fact that humans really have intentionality, whereas machines do not (at least so far), is what makes all the difference between them. His famous and much debated illustration of this point is another thought experiment called the Chinese Room argument (Searle 1980).

2.4.3. Achievability of Artificial Intelligence

A closely related and hotly debated issue is whether it is possible in principle or practice to build a system which has consciousness, intentionality or intelligence. Emotions run high on both sides of this argument, and opinions run the whole gamut from the assertion that even the early AI systems like the General Problem Solver should legitimately be said to be intelligent and to have a mind; through a series of stages of belief that though AI has not been achieved yet, it is possible in principle or practice; to the belief that only living, perhaps human, beings have true intelligence and mental states.

This issue is closely tied to opinion about how seriously the computational metaphor should be taken as a description of human cognition, *ie* on its scope and its status. If, for example, one believes that mental processing literally is, at the deepest level, computation, then there is no reason to doubt the possibility in principle of an artificially intelligent machine, though one may well doubt the capability of current technology to produce such a machine. On the other hand, if one believes that computation is a fruitful metaphor for studying (some aspects of) cognition, true AI might not seem to be achievable, although computer models could be considered as throwing light on human cognitive abilities[23]. Searle has made a well-known classification of opinions on this matter into "Strong AI" - the view that in modelling intelligent processes with a computer system, one is actually creating an intelligent device; and "Weak AI" - the view that the discipline AI provides useful insight into human intelligence and cognition, but does not create "minds".

Stillings et al (1987:331) suggest that only a minority of cognitive scientists take computation merely as a convenient descriptive metaphor for human cognition. Pylyshyn takes an especially strong stand on this issue, suggesting that it is actually failure to take the computational analogy literally enough that causes a considerable amount of confusion in cognitive science. His own approach starts from the assumption that cognition literally is

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[23] "Computers will be pivotal in helping us determine how computer-like we are, but the ultimate answer might be 'not very much'." (Gardner 1985:387)

computation, and explores the implications thoroughly. Searle himself takes the rather unusual view that, while human beings literally are information-processers, machines are only metaphorically described as if they were (1985:35). The difference between them, in his opinion, is that humans have intentionality, while machines do not.

A further issue is that of how to decide when, or whether, AI has been achieved in practice. The most famous proposal for such a test is the Turing test, suggested by Turing (1950). Briefly, it says that if it is not possible to tell from the answers given to a series of questions whether the answerer is a machine or a person, and it is a machine, then that machine should be deemed intelligent. Though many problems with this idea have been pointed out since it was proposed, it is still considered a useful theoretical definition. However, since the development of even a candidate for such a test is still a long way off, there is a need for a working definition. The most popular is that a machine's behaviour should be called "intelligent" if it does something that would be described as requiring intelligence if a human did it (Gardner 1985:140).

2.4.4. Mind and Brain

One of the traditional philosophical problems that cognitive science claims to throw new light on is that of the relationship of the mind to the body - of mental events to physical events. Specifically the issue has been to explain how mental events can (seem to) have causal powers over physical ones, *eg* how a decision (mental) can cause an act (physical). This area is notorious for the concept of dualism, the doctrine that the mind is "made of" some immaterial substance, or "soul-stuff", which can somehow - magically - interact causally with physical or physiological "stuff". Such a doctrine would of course be anathema to cognitivist philosophy, but the cognitivist tenets allow a neat solution to the mind-body problem:

> "From the philosophical point of view, computational insights enable us to understand how it is possible for the immaterial mind and the material body to be closely related, and in particular how it is possible for the mind to act on the body during purposive action and voluntary choice." (Boden 1979:111-112)

In fact, however, the statement of the problem has changed somewhat in the course of translation into cognitivist terms. Specifically, it has become the mind-brain problem - cognitive science tends to ignore the rest of the body - and has been recast as the problem of how mental states relate to brain states. The solution, simply put, is that the two are the same: a mental event simply is a (kind of) physical (material) event, described in a certain way. In human beings, specifically, a mental event is a kind of neural event. This however does not put an end to the debate. There is still the important issue of deciding how the two kinds of description - mental and neural - relate to one another[24]. The crux of the matter is whether mental terms can in fact be *reduced to* neural ones, or whether there is a need in different contexts for both kinds of description.

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[24]A review of this debate is provided by Mackay (1984).

The reductionist view is that the two are identical. In principle, anything that can be said in mental terms can be said equally well, or better, in neurological terms. The reason mental terms are used in everyday language is simply to do with habit and tradition. The reason they have to be used in psychology and cognitive science is that we do not yet know enough neuroscience to do without them. On this view it seems likely that one day it will be possible to dispense with the mental vocabulary altogether. This position - sometimes called "eliminative materialism" - was once considered overly simplistic, and "reductionist" was used as a derogatory epithet. Recently though it has been elaborated by some highly sophisticated thinkers, who argue that "reductionism" is not the bogey it has sometimes been thought, but an important tool for understanding cognition (*eg* Churchland 1986; Rorty 1980; Stich 1983).

Others prefer the view that the descriptions at the two levels - mental and physical - are significantly different (though descriptions of "the same things"), and reduction is not possible. One such view is dubbed "anomalous materialism", and states that there is no lawlike relationship between the levels of description - terms from each are needed in different circumstances. For example, Davidson (1981) argues that while *individual* mental events are identical with individual physical events, *classes* of psychological events are not coterminous with, or their descriptions interchangeable with, classes of physical events. Mental events are sometimes said to be "supervenient upon" physical ones: different from, but in a sense dependent on, them.

Mandler exemplifies the view that the problem should be dissolved, rather than argued over: the ability of mental events to cause physical ones is not real, but only apparent. In fact, "both mental and physical events are products of underlying representations and processes" (Mandler 1985:30).

2.4.5. Knowledge

A very straightforward interpretation of the implications of the central tenets of cognitivist philosophy for human cognition might seem to imply that all knowledge is represented explicitly in memory. It has become clear however that there are some major problems with this view. It seems unlikely, for example, that everything we know can be individually represented in the "knowledge base" of the mind: though someone might "know" that 247 + 1 = 248, it seems extremely implausible to suggest that every such piece of knowledge is individually represented in their memory.

Numbers are a rather simple case. It is easy to see how they might be dealt with straightforwardly by generative rules of inference and deduction. Consider the analogous problem for more semantic kinds of knowledge:

> "Suppose that the way we understand [that the pronoun in 'I left my raincoat in the bath because *it* was wet'] is by retrieving the fact *that putting a raincoat in a bathtub makes sense if the raincoat is wet, but not if the bathtub is.* This would be a pretty strange piece of knowledge to have floating around in our heads. Think of how many others we would have

to have if this is really how we worked: *that grizzly bears don't like champagne, that there is no major league baseball on Uranus,* and so on ad infinitum. Probably then this is not the right account." (Stillings et al 1987:351, their emphasis)

It might seem then that knowledge must be organised in some way whcih would allow specific facts to be inferred from representations of more general ones. There have been some attempts to develop models of language understanding based on such inferences (notably Schank's, described *eg* in Gardner 1985). However, these raise many questions of detail: How to characterise the atomic facts? Which beliefs are explicitly represented, and which are inferred? How is the knowledge organised, and how are such inferences made? Such accounts are thus believed by some to be implausible.

Much of the knowledge we use in everyday life is not specialised information, but practical, mundane facts, barely worthy of the term "knowledge". Accounts which attempt to represent all of it explicitly are sometimes said to lead to an infinite regress: how is the knowledge of how to apply the representations represented? Some see the solution to the problem as requiring a distinction between two different kinds of knowledge. Not all our knowledge is "declarative", and explicitly representable at all. Some, and often the most basic, is "procedural" knowledge - *ie* to do with knowing *how*, rather than knowing *that*[25]. A classic example is knowledge of how to ride a bicycle. It is not possible to teach someone how to do such things simply by telling them facts about the operation - it is not even easy to work out what would be the facts they should be told. Knowledge like this requires physical experience and practical learning: it seems to be somehow "wired in"[26]. This creates a difficulty for the purely abstract, functional approach to AI, since procedural knowledge seems to implicate the body in various ways. One avenue of exploration of these issues in cognitive science is the development of robotics.

Mandler (1985:31) thinks that some of these difficulties with the cognitivist view of knowledge are caused by overly rigid categorisation into "representation" and "process", which are not in reality as clearly separable in cognition as the standard tenets might imply.

2.4.6. Meaning and Language

The treatment of meaning is an area most cognitivist philosophers would identify as problematic for their position. Defining what exactly "meaning" means is a big part of the problem. In general, as seen above, it is seen as something associated with a linguistic structure or other representation, as its interpretation. Cognitivist philosophy thus distinguishes between the *form* and the *content* of a representation and stresses the separation of the two.

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[25]A similar kind of distinction is sometimes drawn between episodic and semantic memory.

[26]McDermott (1981) on the other hand expresses impatience with the whole topic of declarative vs. procedural, clearly considering it to be a dead-end distinction.

This separation of form and content is the source of some contentious issues. As we have seen, in cognitivist philosophy what matters about mental representations is the functional relationships of their forms, rather than their actual content, or their relation to things outside the system itself. This view is held by many cognitivist philosopers, most notably by Fodor, who advocates "methodological solipsism"[27] as the best approach to studying the cognitive system, on the grounds that symbols in a computational system can relate only to each other, not to things outside the system. However, it is disputed by others. Pylyshyn (1984) for example argues that it is not possible to account for the many different kinds of behaviour a person who hears the cry "Fire! Fire!" can evince (running from the building, dialling a telephone, packing belongings, etc) without reference to the meaning of fire in the external world, for that person, *ie* the relation of their internal representation to fire in the external world. Others counter the form/content distinction with the example of everyday reasoning, which often, in real life, is influenced not only by the form of the logical problem, but also by its content, *ie* the things referred to. (Many examples in Cohen 1977). It also seems clear to some (*eg* Jenkins 1974) that memory is organised according to meanings, as well as formal properties.

A related problem is that the simplest, most serial type of symbolic processing, in which all the processing is completed before the interpretation of the output is accessed, seems inadequate to account for most cognition. (This issue as it relates to speech perception models was discussed in detail in Chapter 1). It is frequently the case that even quite early stages of processing require some interpretation, or access to the content of the symbols. The most common way of dealing with this is to propose that modules at different levels can interact, or have access to each other's output and perhaps even each other's processing. It is sometimes accounted for (*eg* Sanford 1987) by suggesting that some kind of "primary processing" is performed on the input, to access at least the general semantic area involved before detailed processing begins. Another frequently mentioned way of accounting for this is that some kind of parallel processing is in operation, so that the various stages can interact. There is also some interest in the possibilities of content-addressable technology.

As for meaning in language, it has been stated already that the cognitivist view sees the meaning of a word as something associated with its form (sound or shape). Minsky puts this idea especially boldly, but not uncharacteristically:

> "It is the underlying emptiness of words that gives them their versatility. The less there is in a treasure trove, the more you'll be able to put into it." (Minsky 1987:196)

Similarly, the meaning of a sentence, is seen traditionally as a semantic representation associated with its syntactic form. The same kinds of problems have arisen over this separation of form and content as those just mentioned. The battle over the relationship between syntax and semantics has raged since the early days of transformational generative

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[27] "... the doctrine that in explaining cognitive states we do not need to bother about the way the world outside the mind is, only about the way the mind represents it." (Macnamara 1988)

grammar (*eg* Fodor and Katz 1964, Steinberg and Jakobovits 1971, Seuren 1974). The comment is often made that meaning has traditionally been given too peripheral a place relative to formal or structural aspects of both language and cognition generally - *ie* that syntax has been given too much priority over semantics (*eg* Oettinger 1972).

Another important class of problems concerns the view of language as a rule-governed formal system. An increasing interest in pragmatics and language use (partly stimulated by the need to incorporate this kind of knowledge into AI systems) has led many to question the regularity of the rules (see Baker and Hacker 1984 for Wittgensteinian arguments on this topic; also Harris 1980, 1981). The separation of competence and performance has also come under considerable attack, especially in relation to child language acquisition.

Recently there has been considerable interest in the relationship of the literal to the metaphorical, and in general the problem of providing a cognitivist account of what metaphors are, how they arise, how they are used. This issue is explored very effectively in Ortony (1979); see also Lakoff and Johnson (1981), Lakoff (1987). Some attempts have been made to account for these kinds of relationships within an orthodox cognitivist framework (*eg* Minsky 1987).

2.4.7. Interpretation

It will be recalled that the point of postulating that cognition is a symbolic process is that the symbols need not be attached to particular meanings during the computation, and the process can be applied in many different situations. At some stage, then, the symbols must be interpreted, *ie* - associated with the relevant semantic representation so that their meanings or contents can be accessed. The question of how this accessing is accomplished is the problem of interpretation. In general, this is assumed to be a fairly simple and unproblematic process of matching the form of the input (suitably processed) against a form stored in memory. Some cognitive philosophers however address the "homunculus problem".

A philosophical account of some aspect of human ability is said to invoke a homunculus ("little man") if it seems to presuppose the very quality it purports to explain. For example a theory of vision which suggested that the way vision works is that an image of the scene seen is projected onto the retina could be accused of invoking a homunculus: the question can be asked "who sees the image on the retina? And how is their vision explained? As an image on the retina?" In other words, it presupposes visual abilities in its explanation of vision. The problem is often phrased in terms of an explanation leading to an "infinite regress".

In relation to cognitivist philosophy the question is about whether, in explaining intelligence in the way it does, it is merely postulating a lot of sub-systems which would have to have as much intelligence as the total system for the explanation to work. This would be the case, for

example, if interpreting the symbols manipulated by the system required as much intelligence as is being explained by mechanism of symbol-manipulation. There are various ways of dealing with this. Dennett provides an account of symbol manipulation which he claims obviates the need for a homunculus in the bad sense. His solution uses the notion of "discharging homunculi":

> "One starts ... with a specification of ... an intentional system, and then breaks that largest system down into an organisation of subsystems, each of which could itself be viewed as an intentional system (with its own specialised beliefs and desires) and so formally a homunculus....Homunculi are bogeymen only if they duplicate *entire* the talents they are rung in to explain...If one can get a team or committee of *relatively* ignorant, narrow-minded, blind homunculi to produce the intelligent behaviour of the whole, this is progress...Eventually this nesting of boxes within boxes lands you with homunculi so stupid (all they have to do is remember whether to say yes or no when asked) that they can be, as one says, 'replaced by a machine'. One *discharges* fancy homunculi by organising armies of such idiots to do the work." (Dennett 1978:123-4; his emphases)

Thus he argues that data-structures are examples of representations that can be said to understand themselves (1978:102), and there is no "homunculus problem".

Minsky's (1987) view that minds are "societies" of "agents" is a similar solution. In fact it is quite a popular view, put forward in some textbooks:

> "As we descend through the *levels of decomposition* in the explanation, the spark of intelligence required for the processes at each level gradually dims, until we reach the machine language instructions, which are easy to implement mechanically. The ghost [in the machine] is exorcised by gradually reducing it to simple formal operations as we elaborate the explanation." (Stillings et al 1987:313, their emphasis)

Pylyshyn's solution is different. He believes that if the view that cognition literally is computation is taken seriously and strictly the problem does not arise, because the symbols of a computational system are essentially different from the more familiar symbols of semiotics, which he calls "secondary symbols":

> "The symbols of the semiotician have no meanings and exhibit no behaviour unless there is an intelligent, knowing agent to interpret them. These secondary symbols get all their meaning from their social and conventional (and sometimes personal) use... By contrast, mental symbols of the sort that concern cognitive science ... have intrinsic meaning (semantics) by virtue of being instantiated in a physical mechanism in such a way that they interact causally with each other and the world outside (through transducers)." (Pylyshyn 1984:118)

Here too, the solution is seen in terms of a theory with a special kind of symbol, which does not need interpretation in the same way as the familiar kinds of symbols do.

Most cognitive philosophers, as mentioned above, do not consider this a serious problem for their view. Some in fact see it as an another traditional philosophical conundrum that the computational analogy overcomes:

> "The existence of the computer provides concrete proof that the commonsense notion of representation is indeed viable." (Baars 1986:149-150)

2.5. Status of Cognitivist Philosophy

In this section, as in the analogous section of Chapter 1, I would like to consider the status of cognitivism in the eyes of its own practitioners. This topic could actually have been included with those of the previous section, since, as seen briefly in the Introduction above, its own status is a debated issue in cognitive science[28]. Some (*eg* Lachman Lachman and Butterfield 1979) believe cognitivism is (perhaps gradually) achieving that of a (Kuhnian) "normal science", while others (*eg* Gardner 1985:384) see it as still in the early stages of his cycle, lacking consensus with respect to basic assumptions and unity in terms of research programme. This heterogeneity is commented on by Mehler and Franck in their editorial comment introducing the tenth anniversary volume of *Cognition*:

> "There are those who are convinced that information processing and artificial intelligence hold the keys to the future; those who believe that there is no future for the field as a whole and those who believe that cognitive science will only come of age when it has developed a more descriptive approach displaying greater concern for ecological parameters. Finally, there are those who have refused to engage in any speculation whatsoever, and have opted to remain close to the data they have gathered within the paradigm they have developed. But ... one feeling pervades our reading of all the articles, and that is that the field is in rapid expansion without any homogeny of approach." (Mehler and Franck 1981:4)

Most would agree that the straightforward view of cognition arising from the basic cognitivist tenets is overly simplistic - *ie* almost all would accept at least some of the problems mentioned in the review above as real ones. The difference of opinion is over whether or not the problems can be satisfactorily solved within the basic tenets of cognitivism, *ie* whether "more of the same" research will suffice, or whether something different is needed as well[29] is probably the most famous discussion of this issue - see Cohen (1977), Leahey (1980) for summaries and comment. I will mention in this section what seem to be the major issues in the discussion.

One is the ability of cognitivism to provide an account of what have till now often been taken to be peripheral topics: emotion, motivation, consciousness, attention, subjective experience, language use and cognition in the context of everyday life, informal reasoning, and so on[30], Machlup and Mansfield (1983), Cohen (1977), to name just a few of those who consider these problems; Smyth et al (1987) have developed their approach with specific focus on cognition in action. Many comments centre around the problems cognitivism has in accounting for meaning and "ecological validity" mentioned above, and the difficulties of theory, method and interpretation.

Doubts and criticisms of cognitivism for its lack of attention to these kinds of issues have of course been around for a long time, offered by those both within and outwith cognitive science:

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[28]This is clearly related to the status of IP, as a theory within its philosophical framework, which was discussed at the end of Chapter 1.

[29]Newell (1973)

[30]See Norman (1981)

"... it almost seems as if the perception of meaning were primary and everything else a consequence of understanding meaning. If this were true, linguistics would have to be built anew." (Oettinger 1968:296)

"The gambit disclosed ... is the following: If man doesn't know the underlying physiology of his actions, maybe it's all right to suppose these actions resemble the actions of a computer. Such an argument makes as much sense as supposing that if man understands bicycles and doesn't understand airplanes, he can assert that 'airplanes are bicycles'." (Taube 1961:50)

"First it is asserted that except for trivial engineering details, a program for a machine is equivalent to a machine. The flow chart for the program is equated to the program. And finally, the statement that a flow chart could be written for the non-existent program for a non-existent machine established the existence of the machine." (Taube 1961:59)

Probably most famous, and most scathing, was Dreyfus:

"Obviously [AI researchers] think that analogies are solved by human beings by applying transformation rules because the prospects for AI are only encouraging if this is how humans proceed. But it is clearly circular to base one's optimism on a hypothesis which, in turn, is only justified by the fact that if the hypothesis were true, one's optimism would be justified." (Dreyfus 1972:142)

Little notice was taken of these comments at the time they were made, however, partly because, however justified a scathing tone might have been, it was not conducive to effective communication; partly because the cognitive science community in those days was really too confident and too busy getting on with their own exciting projects to spend much energy analysing exactly what was being said. But perhaps mostly because no viable alternative was being proposed.

"[The suggestion that meaning is central] does seem to have been lost from sight, and perhaps deservedly so, because ... it doesn't tell one what to do next." (Oettinger 1968)

Fault-finding has often been seen as churlish, in the absence of something better to replace what was being criticised[31]. Practical advances have been seen as the main requirement. Increasingly however these kinds of issues are taken seriously by those within the cognitivist community, as some of the discussion above has shown (*cf* Norman 1981, Neisser 1976, Stillings et al 1987). There have been several famous apostates: Weizenbaum (1976/1984); Winograd (1981; Winograd and Flores 1986) has taken Dreyfus' phenomenogical comments very seriously, and worked them into a new approach to expert systems design.

As well, there are various breakaway groups attempting to establish new approaches to the study of cognition on different conceptual bases. Two of the most successful in terms of attracting interest (though neither has so far achieved a position of dominance) are actually revivals of previously neglected approaches. Gibson's Ecological Perception is receiving an increasing amount of attention (Costall and Still 1987; Neisser 1976); Rosenblatt's "perceptron" idea has been taken up and expanded considerably by the PDP group (1986), and is currently very popular and influential. Both of these were mentioned briefly in connection with speech perception research in Chapter 1; I will talk about their philosophical frameworks in Chapter 4.

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[31] *Eg* Loftus on Jenkins (1974); Newell/(1983) on Hofstadter.
in Machlup & Mansfield.

Many cognitivists however, while agreeing that there are some conceptual problems in cognitive science (perhaps amounting to "turmoil" or even a "crisis"[32] and that the alternatives have something of truth about them, nevertheless believe that the basic tenets of cognitivism are the best ones, and that their limits have not yet been sufficiently explored (Boden 1981, Miller and Gazzaniga 1984). The alternatives are welcomed for their opening up of issues for debate, but many consider their drawbacks to be considerable (see for example Fodor and Pylyshyn 1981[33], 1988; and the responses to Fowler 1986.

The key factor here seems to be distrust of subjective or "introspectionist" methods, and the need to constrain and control the variables being studied in any particular case. The cognitivist tenets are felt to be the only foundation which can allow both the necessary constraints on research and theory, and the necessary flexibility of behaviour in the systems developed.

> "...the only psychology that could possibly succeed in explaining the complexities of human activity must posit internal representations. This premise has been deemed obvious by all but radical behaviorists..." (Dennett 1978:119)

> "Being governed by representations is not the same as being formal and computational. Nonetheless, computation is the *only* model we have of how a physical system can be governed by representations." (Pylyshyn 1984:117, his emphasis)

> "At present ... any theory of mind should certainly be restricted to an effective procedure. To abandon this criterion is to allow that theories can be vague, confused and ... only properly understood by their proponents." (Johnson-Laird 1981:142)

> "Whoever wishes to banish the representational level from scientific discourse would be compelled to explain language, problem-solving, classification and the like strictly in terms of neurological and cultural analysis. The discoveries of the last thirty years make such an alternative most unpalatable." (Gardner 1985:383)

2.6. Discussion

2.6.1. The Subject in Cognitivist Philosophy

Thus far, I have been concerned to present a balanced overview of the cognitivist foundation of the IP model of speech perception, as seen by cognitive scientists themselves. I would like now to step back, as I did at the end of Chapter 1, and consider this foundation from a different perspective. I have foreshadowed already my view that cognitive philosophy suffers from some problems which can be seen as underlying, and in a sense causing, difficulties in the IP model of speech perception. In a nutshell, the remainder of this thesis argues that cognitivism, and thus the IP model based on it, has severe problems, centred around the fact that it has an inappropriate conception of what a human being - the Subject of speech perception - is like. I will begin that argument in this last section of Chapter 2. Its completion will have to wait until Chapter 4, as it requires the background I will provide in Chapter 3.

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[32]Mandler (1985:35); Leahey (1980:392); Eysenck (1984); Cohen (1977); Pylyshyn (1980), Macnamara (1988).

[33]Fodor and Pylyshyn (1981:154), discussing the non-computational Gibsonian account, describe the proposal to do without representation and process as not "radical" but "suicidal".

It is necessary then to consider what kind of Subject cognitivism does postulate. In fact, cognitivism does not generally discuss the nature of the Subject as such. It is more usual to talk about the nature of intelligence, or of intelligent processes like perception, than about the nature of the being that carries out the processes. It is clear though that if one makes a claim about the nature of a process, one is *ipso facto* making a claim about the nature of the processor as well. In the case of cognitivism, then, the fundamental tenet, discussed in detail above, that cognition is, essentially, symbol-manipulation or information-processing, implies that the Subject is, essentially, a symbol manipulator or information processor. This is not to say that cognitive science does not allow the Subject ever to be anything other than a symbol manipulator; it is to say that cognitive science claims that as far as cognitive processes are concerned, the essential nature of the Subject - the quality that makes for intelligent action - is to be a manipulator of symbols. My argument here is that a Subject which is essentially a symbol-manipulator could not perform all the cognitive tasks that cognitive science tries to explain in this way - in particular, it could not understand speech.

2.6.1.1. Symbol Interpretation

I would like to start by picking up again the topic of the interpretation of the symbols manipulated in cognitive processing (Sec. 2.4.7 above). This is the point at which the (necessarily) non-meaningful physical symbols which have been manipulated and transformed are made meaningful - "mapped onto meaning"; "translated into meaning" - resulting in understanding.

It will be recalled that for cognitive science, this interpretation is a process of matching forms and thus accessing a stored semantic representation. The well-known philosophical problem for such an account, discussed above, is that of the "homunculus": an unadmitted theoretical entity invoked by an account which postulates as an *explanation* of interpretation something which is just as difficult to interpret as the original. It will be recalled that those cognitive philosophers who consider the problem reject the suggestion that cognitivist theories of perception invoke a homunculus - for example, Dennett's account (that any homunculi are "discharged") was seen above to be quite well-accepted. My claim here however will be that the cognitivist account of interpretation really does suffer from the problem of the homunculus[34], the explanations quoted earlier notwithstanding.

In fact, the problem of the homunculus is surprisingly undisturbing for many cognitive scientists. The reason, I surmise, is that the symbols we see as output from the programs run as simulations of mental processes seem to us unquestionably and inherently meaningful, especially when they are simple symbols like numbers, as opposed to texts, whose interpretation might be more debatable. But of course no matter how "simple" their interpretation is to us, all such symbols (better called "characters") are meaningless in

[34]As Crick (1979:134) remarks wryly, "Unfortunately, it is easier to state the fallacy [of the homunculus] than to avoid falling into it".

themselves. The basis of the generality of computational processes after all, as seen above, is that the symbols should be meaningless, and transformed according to purely physical laws. They therefore need somehow to be "given meaning" at some stage, to relate them to the actual situation in which the computation is being carried out. Cognitivism, and IP, as has been seen several times above, see this as being accomplished by the matching of a formal representation with a stored meaning.

As I see it, this account faces a problem with two parts. Firstly, to account for the interpretation of symbols by saying that they are matched with a semantic representation does not actually *explain* understanding and meaningfulness - it simply replaces one representation with another, and begs the question of how the semantic representation itself is to be interpreted. Merely calling it a "semantic" representation does not make it meaningful.

A solution like Dennett's is a response not to this objection but to another one: it counters the anti-intellectualist, behaviourist position which prefers not to invoke knowledge and intelligence at all - whether or not it is in the form of mental representations and processing - by justifying the tactic Dennett calls "putting a little man in there to do the job". What it does not address is the question of "who" is putting the little man in; and "who" tells him what the symbols he is manipulating actually mean. In the case of the computer program, this kind of interpreting is done by the programmer, who has a human understanding of the whole situation in which the program is being run. This kind of understanding is not available within the program itself; or to a symbol-manipulating Subject such as cognitivist philosophy postulates human beings are. All the "knowledge" and "rules" that cognitivist philosophy can give its Subject ultimately do not help overcome this problem: they are all given (necessarily) in the same kind of uninterpreted formal structures.

So in the computational terminology of cognitivist philosophy, which sees cognition as being very like the running of a complex computer program[35], the homunculus problem cognitive science faces can be stated as: "Who takes the role of the programmer, and interprets the symbols produced as output from the program which has been run? Who reads the printout?"[36].

The second part of the problem with the cognitivist account of interpretation is somewhat different. This account relies heavily, as has been seen, on the notion of *matching* of two formally defined tokens - the output of the processing[37] and the representation used to

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[35]"...a symbolic process that transforms formal expressions that are in turn interpreted in terms of some domain of representation." (Pylyshyn 1980:115)

[36]Similar observations about the programmer implicitly assumed in symbol manipulation accounts are made by Carello et al (1984), though the direction their argument takes from that point (towards a Gibsonian "Direct Perception" account) is very different from mine. I will discuss the differences in Chapter 4.

[37]The need to achieve a matching like this is after all the motivation for postulating the processing of the input.

access the stored meaning. Matching, like interpretation, is a process which seems very straightforward when we do it in everyday settings - but it cannot be done according to purely formal criteria. It is an instance of the more general problem of stating when two things are "the same". Stating two things to be "the same", formally or otherwise, requires decisions as to which features should be compared; which features are relevant and which irrelevant; the degree of difference to be tolerated as a "threshold"; and so on. These decisions require an understanding of the context in which the matching is to be carried out. Indeed, it requires exactly the kind of decision-making, and exactly the kind of understanding, that cognitivism is trying to explain with the symbol-manipulating account - and yet here is the same problem turning up as part of the proffered explanation.

2.6.1.2. Symbol Designation

If cognitivism pays little attention to the problems surrounding the interpretation of symbols - their "conversion into meanings" - it pays far less to the problems of the initial designation of those symbols as representative of features of the world. The reason, again, I believe, is that it seems to be such a straightforward operation of association or matching: if we decide to symbolise one thing with another, it seems like a very simple matter of choosing an appropriate representation, and instituting a convention that from now on it will stand for the thing we want to symbolise.

This seeming simplicity however, is due to familiarity, not ease of explanation by cognitivist philosophy. Again there are two kinds of problem. The first is another instance of the difficulty just discussed of deciding that two things are "the same". Knowing which symbol to associate with which feature of the world is far from straightforward - it involves all the well-known difficulties of categorisation and classification. In short, it requires an understanding of the whole context in which the association is being carried out.

Secondly, more important, and perhaps more difficult to grasp - taking "symbolisation" as the first step of cognitive processes presupposes that the objects or features being symbolised exist in the world already constituted as what they are. The processing system has only to recognise them and associate appropriate symbols with them (in itself, not unproblematic, as already discussed). But of course, "reality" does not come neatly packaged and labelled, ready to have symbols attached to its objects, features and facts - as is well known to cognitivism. A large part of the motivation of cognitive science, after all, was disagreement with the behaviourist notion that recognition is simple matching. Cognitivism saw recognition as problematic and devised the symbol-manipulation account as an *explanation*, a mechanism whereby it could be achieved.

However, in explaining the recognition of largish, meaningful objects in the world, cognitivism relies on the recognition of small, meaningless ones - apparently assuming that where recognition of *objects* like chairs and people and words is a problem, recognition of their *features* is not. This is absolutely erroneous. Cognitive science depends on the belief that

small sets of features can be found and given formal definitions to make the formal symbol systems go. Repeated failure to achieve this goal gives weight to my argument that the "constitution" of small features in regular, formally defined sets is no easier to account for with cognitivist explanations than the constitution of larger objects with context-dependent definitions is for behaviourism.

I have talked here about problems with the tenet of representation for cognitive science. It will be seen that the same kinds of problems arise with respect to the central cognitivist tenet of processing by rules. Specification of what rules to apply requires abstraction of the form of the rules from observation of many instances; knowledge of which rules to apply in any particular circumstance requires background understanding of the situation in which they are to be applied.

It would appear then that cognitivist philosophy's "symbol manipulation" can account for at most a part of human cognition: the middle phase, between symbol designation and rule specification at one end, and rule application and symbol interpretation at the other. Their account thus starts after the beginning and stops before the end of all that needs to be explained about cognition. That would not be a major problem - assuming cognitivist explanations recognised, and remained within, the boundaries of their explanatory power - if this middle phase was sensibly separable, and the division into symbolisation, processing and interpretation was a reasonable way of breaking down cognitive tasks.

In fact, I do not believe this is the case. Each of the "stages" in cognitivism's account of perception requires a certain kind of understanding for its functioning. In particular, each requires the same kind of background understanding of the meanings and significances in the situation as is being "explained" by the processing model as a whole. My claim is that this understanding is necessarily *non-formal*. Understanding depends on meaningfulness. Meaning and significance are not already *in* situations, merely to be *apprehended* by the Subject. They arise through the interaction of the "reality" and the Subject's purposes, values, interpretations, understanding, and so on. The understanding a Subject has of a situation is thus part of what *constitutes* the meanings according to which the Subject can make apparently simple and obvious judgments like "same" or "different". This kind of understanding cannot be achieved by a formal, symbol-manipulating system[38]. Thus "subjective experience" is not something extra a good theory of cognition has to explain, on top of what cognitivism sees as central abilities (logical problem solving, etc). Subjective experience is the *condition* of meaningfulness. If cognition involves symbol manipulation at all (and indeed some "high-level" kinds of cognition do seem well-explained by such a description) it must involve other processes as well; it cannot be symbol manipulation "all the way down". Furthermore, if my position is right, the symbolic processes *depend upon* these

[38] I am not yet in a position to elaborate and defend these claims in detail here; I will do that in Chapter 4.

other, non-formal processes[39].

This allows me to explain my disagreement with even those cognitivists who do acknowledge these problems of definition and application of symbols and rules, but believe that they are solvable within the cognitivist framework, for example:

> "To study representations ... is to concern oneself with intentional matters, with the way in which meanings are constructed, organized, transformed and utilized by the system in question." (Boden 1979:119)

> "...theorising in a programming mode forces the theorist to specify, not merely that a particular cue-schema pair is activated in a given psychological context, but how the cue is identified as such..." (Boden 1979:121)

Boden is concerned to show that cognitivism can (or should be able to) account for the fact that a system recognises features of the world in ways that are relevant to its own concerns in the context, rather than according to some "objectively true" definition. For example, whether a particular thing in the world is called the morning star or the evening star depends on who is looking at it and in which context. Similarly, whether a particular combination of lines is seen as the corner of a cube or as random lines depends on more than just its "objective" features. This is an important kind of insight, and it is possible that a symbol manipulating system could make these distinctions. It is not the point I am making here though. A cognitivist account might show how a particular object is represented in one way rather than another. The problem I am raising is that of how object comes to be *anything at all* for the system, to be meaningful in any way at all to it. This part of the account cannot be covered by a symbol manipulation device. Again, I will come back to these points in much greater detail in the course of the following chapters.

2.6.2. Monism

Having seen how cognitivism's postulation of a symbol-manipulating Subject implies some presupposition about the nature of the world (*ie* that (some of) its objects are already constituted as what they are), it is relevant now to consider cognitivism's understanding of the nature of the world. The fundamental fact about the world as far as cognitivist philosophy is concerned, is, as has been seen, that it consists of only material entities. This is the central doctrine of *monism*. It will be recalled that the "breakthrough" achieved by cognitive science was its ability, with the description of cognition as symbol-manipulation, to postulate a Subject which could carry out intelligent cognitive processes without recourse to non-material entities in the explanation.

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[39]This would seem to be a situation analogous to that described by Gödel's theorem: that a complete description of a formal system requires necessary reference to terms *outside* those of the formal system itself, so no formal system can ever describe itself. A rather similar argument to the one I am making here is put forward by Carello et al 1984 (though as already mentioned they are arguing against IP from a Gibsonian perspective) when they claim that a system operating only in discrete (*ie* symbolic) mode can never achieve self-complexing and generation of new primitives, and therefore no symbolic account could cover all the behaviour of natural systems.

However, in applying the monist principle, cognitivism confuses the *existence of* an entity with its *existence-as* (some description or interpretation). An existent material entity can exist *as* any number of different descriptions or interpretations, depending on the context and the observer, as has just been discussed. *In itself,* however, it merely exists; there is nothing it exists as. To say *that* something exists is one thing; to say *what* it is another. Cognitivism does not take sufficient account of this distinction.

This confusion has some extremely significant effects on cognitivist theory. For one thing it is made blind to some crucial ontological distinctions - most notably, the differences between object, symbol and symbol-user. If these are all material entities, for cognitive science that is all that needs to be said about them. Stopping at the assertion that they are material entities it is not incorrect, but it is incomplete. It fails to mention the most important characteristics of the entity described. One example of an important question in this context is "What does it take for something to exist *as* a symbol?" It seems clear that it involves more than mere material existence. Crucially, it involves the existence of a Subject of a kind which can use it as a symbol. Another question is "What does it take for something to exist *as* a symbol-user, or interpreter?" Certainly physical symbols and physical interpreters can be material things of the same kind. But they are not *only* material things: in their existence *as* symbols or *as* interpreters they differ crucially. Cognitivist philosophy in its eagerness to be monist is insensitive to the kinds of differences there can be in things' existence *as*. One important example of this failing has already been mentioned. Cognitivism fails to provide any account of the Subject of cognition as a being to whom (or to which) objects *can* be meaningful, informative, symbolic, etc. Indeed, it cannot account for the Subject as a being for whom or which objects can arise in the world at all - it must simply presuppose the "prepackaged" existence of some atomic elements out of which objects can be constructed, as explained above.

Certainly it is true that cognitivism is not naive about this. As shown above, it is at pains to explain that "higher level" objects have to be built up out of small "low level" ones (as opposed to behaviourism, which assumed Subects could simply read off what something is), and that this requires intelligence. The question it does not answer, or even raise, is how these "low-level" objects (features, cues, information-bearing units) come to *exist as* what they are. In fact it is no simpler to explain recognition of something simple than of something complex in the absence of consideration of who or what is doing the recognising. Cognitivism is simply ignoring the contribution of Subjects in the shape of its researchers who are both constituting these objects and designating them as "basic" or "low level".

The second point to make about the tenet of monism is that in cognitivist *practice*, monism means more than it states: it means that physical descriptions of entities are preferred to other descriptions. Cognitive science behaves as though mere existence were equivalent to existence-as (physical description) - *ie* as if a description in physical terms were a neutral description. Since material existence is seen as the ultimate, unchallengeable kind of existence, and material things are seen as best described in the language of physics, a

confusion arises between material existence and existence *as* say, atoms, light rays or speech waves. This allows cognitivism an acceptance of entities with a physical description as neutral, "merely existent" material entities. Thus it comes to seem that the level of description that uses terms like atoms, etc, is more concrete, self-existent or "real", than others. Explanations for the existence of other levels of description are to be in terms of these "concrete", "material" entities, and to show how "higher level" entities could be derived from them.

Actually, the picture is yet further complicated by the fact that cognitivism's monism does not in fact live up to its own principles at all. Cognitivism is far from operating only with observable material entities. It depends crucially on abstract, formal and functional entities, which it treats "as if" they were material. Thus cognitivist philosophy can claim to have a monist ontology while still allowing central status to abstract rules, functional descriptions etc.

There is a strong relationship between the foundational tenet of monism and the nature of the Subject that cognitivism can postulate. If it can be assumed, albeit tacitly, that there is a neutral or self-existent description of the world, then it can be assumed that the Subject can take as "input" already constituted Objects, and need only transform them into other Objects. The same tenet of monism however also severely constrains the ways that this transformation of Objects can be achieved. In the development of cognitive science, it seemed obvious that the Subject must be constrained to operate on formal features of representations, rather than with meanings or interpretations. Where context and knowledge have to be taken into account, as cognitivist philosophy argues they must be, against behaviourism, they need first to be formalised in some way. A crucial hidden assumption here, I believe, is that the Subject not only can but must, or can only, operate only with formal features and rules. I have started an argument, above, to show that human Subjects *could not* operate wholly according to principles of "monism" (assuming cognitivism's idiosyncratic definition of this term). In the course of the following chapters I will show in addition that the human Subject *need not* operate according to any such constraints.

2.7. Conclusion

Though, as was seen above, so much is doubted about the cognitivist framework, some aspects of it are never questioned. The three central tenets (to do with representations, rules and functions), and their foundation, monism, are the "givens" with which cognitivist philosophy works, and, importantly in the present context the basis of the "givens" of the IP model of speech perception. But, if my argument above is valid, these tenets have serious limitations if considered as the basis of a general account of human cognition. It should be asked then, finally, why cognitivist philosophy adheres to them so firmly; how are they justified in relation to the objections I have just raised?

The answer is that they are not. Monism is asserted, and the other three tenets derived from it, by reference to behaviourism and dualism, as explained at the beginning of this chapter, and the discussion moves quickly on to other, internal topics. Cognitivism considers its ability to glide between the horns of these two unpalatable positions to be all the justification it needs. But surely this two-dimensional continuum of philosophies with the caricatured endpoints is not a realistic picture of the options? There must be other philosophical positions. There are certainly other *possible* positions[40]. Surely pointing out that there is an ontological difference between a symbol and a symbol-user, or between an abstract "program" and the "hardware" it runs on, does not imply an accusation of a virulent "dualism". Cognitivist philosophy's arguments against behaviourism, however valid, do not in themselves constitute an argument for a computational view of mind.

My argument in this chapter then is that it is essential to question and rethink some of the deepest and most fundamental tenets of cognitive philosophy in order to understand the roots of the problems that it faces. It is not that these tenets are "wrong" and need to be thrown out; but they do need to be seen in a wider perspective, and there is a need for greater clarity with respect to their scope and their effects. The situation here, I believe, is very similar to that of IP as discussed at the end of Chapter 1. There seems to be a feeling among both communities that to start tinkering with the foundational assumptions risks a regression to the bad old days and a loss of all the ground that has been gained since behaviourism was overcome. I think this is clearly counterproductive, and has the effect that much sophisticated thinking is expended on treating symptoms, rather than causes (I will show in some detail how this is what is happening in Chapter 5). It can seem like a loss of ground to start a journey by moving in a direction opposite to that of the destination, but there are many instances in which it is necessary to do just that.

Such a radical rethinking as I recommend, though no doubt mind-expanding, would be rather unmotivated without some constraints and principles directing it along the most profitable lines. What should these be? I have already pinpointed the key problem of cognitivism as its understanding of the nature of human Subjects. Mentioning "subjectivity" in the context of philosophy immediately brings to mind the "subjective philosophy" of phenomenology, noted for its treatment of this topic. Chapter 3 is devoted to an exposition, and analysis of phenomenology, and an appraisal of its relevance to the issues at hand.

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[40]Some cognitivists do indeed claim to consider other philosphical positions before rejecting them. I think the range of options mentioned is extremely limited (Lachman,Lachman and Butterfield 1979, Gregory 1979).

Chapter 3

PHENOMENOLOGICAL PHILOSOPHY

3.1. Introduction

In this chapter I will provide a brief account of the phenomenological tradition of philosophy, as a basis for further discussion of some of the issues raised at the end of Chapter 2. Doing so will I hope have two effects. First, looking at a philosophical framework that is very different in many respects from the familiar one outlined in the last chapter will highlight, by contrast, some features of the latter which are hidden by their very familiarity. Secondly, since phenomenology is specifically concerned with Subjectivity, it might give us some insight into the treatment of the Subject in cognitivist philosophy, the inadequacy of which, I have argued, is a cause of some of its problems. Unfortunately, as will become evident, it will not provide a simple answer to the problems raised in Chapter 2. But the recent history of continental philosophy shows a kind of development which I believe is importantly relevant to cognitivist philosophy.

Because part of what can be learned from phenomenology is contained in the development from one philosopher to the next, and also because it is a rather self-contained and self-referential tradition, so that later texts are hard to understand without knowledge of earlier ones, I will give brief surveys of the work of several central figures of this century, rather than distilling a set of concepts that might characterise the tradition as a whole.

These surveys must inevitably be very limited, if they are to fit within the scope of this thesis, and certainly cannot do full justice to the work of the philosophers they describe. Each of them wrote prolifically, over many years, on complex and interlinked themes, developing an idiosyncratic style and vocabulary suited to his own treatment of the topics. As well, there exists a large body of critical and interpretive work. Here, therefore, I have aimed only to give a general overview, with attention to topics of relevance to present concerns, rather than an exhaustive or detailed description. I have given a higher priority to making the account comprehensible to those familiar with cognitive science, than to detailing all the nuances of thought and terminology of each philosopher. My account is greatly indebted to the following

works, though I have referred to others, which are mentioned at relevant points: Husserl (1900/70, 1913/31), Heidegger (1927/62), Merleau-Ponty (1945/62), Spiegelberg (1982), Schmidt (1985), Schmitt (1969), Spurling (1977), Roche (1973), King (1964), Llewelyn (1985,1986).

The plan I have adopted as an organisation of the chapter is to treat each philosopher in turn, giving first a general outline of the philosopher's work, and then a brief account of his approach to perception and to language. All this is done as far as possible from that philosopher's own perspective. After each such exposition, there is a discussion section, which relates back to the themes of this thesis.

3.2. Husserl

3.2.1. General Philosophy

Edmund Husserl (1859-1938) is known as the Father of Phenomenology, and, although his followers rejected many of his ideas, it is from his work that the central concepts of phenomenological philosophy have developed. He was German[1], and started his career as a mathematician and physicist, studying in Leipzig, Berlin and Vienna. It was during a trip to Vienna (1884-86) that he heard lectures from Brentano.

Franz Brentano (1838-1917) was also German, but had been lecturing in Vienna since 1874. He had been a Catholic priest and theologian, but had left the church and turned to more secular philosophy. His particular interest was in the relationship of philosophy to psychology. His mission - and he did have a strong sense of mission - was to provide a rigorous foundation for psychology and philosophy. He seems to have been a man of extremely firm convictions, and strong personality (see *eg* Husserl's biographical sketch in McAlister 1976).

He believed that contemporary psychological research suffered from severe problems, and that these could be traced to incoherences in the general foundational assumptions underlying the theories. It was necessary, he believed, to undertake a revision and regrounding at this level if these problems were to be solved. His diagnosis was that, in the quest for a "scientific" account, insufficient attention was paid to mental facts. To Brentano, mental phenomena were just as real as physical ones, and ignoring them, or explaining them away, had been to the detriment of both philosophy and psychology. On the other hand, however, he was equally strenuously opposed to postulation of "fictitious entities", such as relations, ideals, values, universals and norms. The world, according to Brentano, consisted only of real things, and real thinkers, and a valid foundation for psychology and philosophy should incorporate only these entities. In his own work Brentano gave a high

[1]That is, German-speaking; he was born in Prossnitz, then part of the Austrian Empire.

priority to the study of mental phenomena and consciousness, previously neglected. He recommended that the best way to carry out such a study was by "inner perception" - which he was at pains to distinguish from "introspection". In introspection, one claims to look into the mind, as if it were a vessel, and describe its contents - a process fraught with possibilities for error or self-deception. Brentano preferred to think of consciousness as an activity, rather than as a container. In inner perception, one simply allows one's awareness to focus on one's present mental activity. At the very moment of inner perception, he claimed, one can in principle claim infallibility. By this means, Brentano divided mental events into three "natural classifications": the activities of *representation* (primary), *judgment*, and *affective valuation*.

Brentano's most famous concept however is that of **intentionality**. He intended it originally as a "mark of the mental" - a way of distinguishing theoretically between mental (psychical) and physical events:

> "Every psychical phenomenon is characterized by ... the intentional ... inexistence of an object, and ... the reference to a content, the directedness toward an object (which in this context is not to be understood as something real) ... Each contains something as its object, though not each in the same manner. In the representation, something is represented, in the judgment something is acknowledged or rejected, in desiring it is desired, etc. This intentional inexistence is peculiar alone to psychical phenomena. No physical phenomenon shows anything like it. And thus we can define psychical phenomena by saying that they are such phenomena as contain objects in themselves by way of intention." (Brentano, quoted in Spiegelberg 1982:36-7).

This is the origin of cognitive philosophy's concept of intentionality discussed in chapter 2. As I mentioned there it is a term which engenders a good deal of confusion, and is used in a variety of different senses. During the course of the present chapter I will call attention to the development the term has undergone in the phenomenological tradition. In chapter 4 I will discuss the whole topic more fully, and will in fact suggest that the confusion is sufficient to make the concept more trouble than it is worth for cognitive science. For the present, I would like to underline the fact that intentionality as described here originally by Brentano refers simultaneously to two aspects of mental events - the "intentionality" of the act itself, *ie* its directedness upon an object[2], or its having of a content[3]; and the "intentional inexistence" of its objects, by which he means that the object of a psychical act need not "exist" in the sense that the object of a physical event must. Brentano's concept is a revival from medieval scholastic philosophy, and the word itself incorporates the medieval sense of "intend" as "stretch toward".

Husserl was impressed by Brentano. He had been concerned already for some time with problems of inconsistency in the foundations of logic, mathematics and science, and thought that Brentano's approach, of defining a more satisfactory ontology by taking greater account

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[2]"Object" here is meant in the sense of any "accusative" of an act of consciousness, not necessarily a material entity.

[3]This relates to what was called in Chapter 2 the "aboutness" of intentional states

of the contribution of consciousness to the constitution of objects, might help to overcome them. Gradually though he came to see that the problems were more general and required more radical rethinking than Brentano allowed for. He changed to philosophy, and devoted the rest of his career, in Gottingen and later Freiburg Universities, to this task of rethinking. His major goal thereafter was the establishment of an absolutely reliable foundation, free from any unjustified presuppositions, from which consistent and reliable philosophical and scientific concepts could be built up.

Husserl was very dissatisfied with any philosophy based on the concepts or facts of natural science, since these are products of what he called the "Natural Attitude", a kind of everyday realism in which objects stand out as simply "there", as what they appear to be, and no questions arise about their origin or validity. This of course is a handy attitude for many everyday purposes, but it ignores the fact that seeing "things" requires the operation of acts of judgment and interpretation, and that such interpretation is based on assumptions and presuppositions which have not themselves been justified, and thus amount to nothing more than naive prejudice. In particular, they can give no account of the origin of the *meaning* of anything perceived.

The natural sciences have been content to ground their concepts in this attitude of naive realism:

> "...Natural science has grown to greatness by pushing ruthlessly aside the rank growth of ancient scepticism and *renouncing* the attempt to conquer it." (Husserl 1913/31:95, his emphasis)

This lack of attention to its philosophical underpinnings had actually brought European science to a crisis, according to Husserl, and it certainly is a disastrous start for philosophy itself. A philosophy based, as traditional philosophy is, on the concepts and terms of natural science simply inherits the contradictions, inconsistencies and paradoxes of the natural attitude.

> "A philosophy with problematic foundations, with paradoxes which arise from the obscurity of the fundamental concepts, is no philosophy, it contradicts its very meaning *as* philosophy. Philosophy can take root only in radical reflexion upon the meaning and possibility of its own scheme." (Husserl 1913/31:27, his emphasis)

So Husserl opposed naive realism - though his philosophy is realist in the sense that he believes perception is of real things themselves, rather than representations, signs or images of the things (*eg* (Husserl 1913/31:135-7). On the other hand, he was equally disgusted with the fashionable contemporary movement towards "psychologism" according to which "truths" (of logic and mathematics, for example) boil down to mere facts of psychology - *ie* are grounded in (feelings of) belief or certainty. To Husserl, this view implies relativism, and thus destroys the meaning of truth and falsity (Spiegelberg 1982:87), and this he could never allow. He was a very firm believer in the real and certain existence of pure or ideal truths of logic, and valued deductive truths far above mere inductive generalisations.

Psychologism can also be seen as a brand of naive idealism, a philosophical stance which minimises the role the real world plays in perception and cognition, and this also counted against it in Husserl's eyes:

"...now as ever I hold every form of current philosophical realism to be in principle absurd, as no less every idealism ... "(Husserl 1913/31:19)

The important thing, he believed, was to *transcend* this dichotomy of realism and idealism that had bedevilled philosophy for so long. For Husserl, as for Brentano, neither objects in the world, nor psychological states of consciousness could be studied in abstraction from the other. We can know a thing only as it appears to us in our experience; and equally we can never conceive of consciousness itself, without some Object[4] of which it is conscious.

"In the very essence of an experience lies determined not only *that*, but also *whereof* it is a consciousness..." (Husserl 1913/31:120, his emphasis)

Thus Brentano's intentionality thesis was adopted and adapted by Husserl. Husserl was not so interested in using the intentional inexistence of an object in the theoretical distinction between mental and physical events that Brentano had used it for. For Husserl, intentionality is the characteristic of consciousness that brings about Objects, or "constitutes" them as what they are. Most importantly, it is the source of meanings, indeed of the meaningfulness of the world, that there is this relationship between Subject and Object.

"For Husserl no "object" is conceivable except as the correlate of an act of consciousness. An "object" is thus never a thing-in-the-world, but is rather something apprehended about a thing; objects are things *as* intended, *as* meant, *as* taken by a subject." (Edie 1976:5, his emphasis)

The world and consciousness are thus *correlates* of each other: "...consciousness and thinghood form a connected whole." (Husserl 1913/31:126)

A brief pause for clarification is perhaps in order here. In this opposition to the Natural Attitude, Husserl is distinguishing between a thing as it exists independently of any consciousness; and the same thing as it exists *in its essence, as what it is* for consciousness. No thing can have an essence or meaning in itself; these it gains only in relation to a consciousness. I will distinguish in my description, though this is not Husserl's own usage, between the word "Thing", which I will use for the former case, a merely existing entity; and the word "Object" which exists *as* something, for some Subject. To describe Husserl's philosophy, a further subdivision is required. He distinguishes between an Object of the intentionality of pure consciousness, in its pure meaning - the "phenomenon" - and an Object of the natural attitude, which is the phenomenon as seen after acts of interpretation, judgment, etc. For Husserl, Things in themselves cannot be known; they have no meaning except insofar as they exist as Objects for a Subject. The World that we know is thus not the world in itself, but the "Life-world", the world as lived in and experienced. On the other hand, the Objects of the Natural Attitude, as has been explained, are distorted from their true essence by unconsidered acts of judgment, etc.

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[4]I will use the term 'Object' in this sense of anything that has being for a Subject. It need not of course be a material object in the everyday sense; it is closer to a grammatical object of any verb of perception, cognition, etc. Thus an Object is a correlate of a Subject, as I use that term.

So Husserl concluded that the reliable starting point for the foundations he was building was with phenomena - that is, with the appearances of things to consciousness before they are distorted or glossed over by the presuppositions and prejudices of the Natural Attitude, as we rush through our lives. If we could come to see and study the pure, unadulterated phenomena, as they are constituted by consciousness, we would have reached a satisfactory level of reliability from which to begin to build philosophy and science with "autonomous self-responsibility" (Husserl 1913/31:29), which could account for every assumption and every inference.

The method by which such a grounding was to be established from phenomena was a key aspect of Husserl's philosophy. He called it the method of *reduction*. His explication of the reduction actually changed considerably over the course of his philosophical career. I will attempt here only a very general characterisation, smoothing out the details which changed.

It can be seen in relation to Husserl's understanding, outlined above, of perception in the Natural Attitude, in which an original phenomenon is acted upon in some way to give the objects of perception. Normally we are quite unaware of the fact that in perceiving we are making judgments and inferences, accepting presuppositions and so on, and they are therefore not checked for validity or accuracy, or scrutinised for possibility of error. There is thus "a sort of blindness in the very heart of seeing" (Ricoeur, 1967:20).

The aim of the reduction is precisely to uncover these normally hidden acts, and thus recover the pure phenomenon as it given to consciousness before we rush in with our interpretations. The watchword of this kind of phenomenological reduction is "zu den Sachen selbst!"[5]. Husserl believed that if this reduction was performed, it would then be possible to uncover the ideal or essential meanings of both the phenomena and the acts or structures of consciousness, and these could be used to provide a foundation for philosophy that was not affected by mere contingent and conditional facts, but was reliably true *in principle*.

The method itself involves a change of viewpoint, through several stages, from that of the natural attitude to a phenomenological attitude. This is an attitude of reflection, in which one takes, as the Object of consciousness, consciousness itself, attempting to bring into view its hidden acts and structures. This requires that one simply ignore everything one normally *knows, believes* or *assumes*, as to matters of fact about the Object in the Natural Attitude, and all the purposes or contexts of the perception, focussing on whatever is occurring in or to consciousness at the time. This ignoring is called by Husserl "suspending" or "bracketting" of everything known (which after all is always prone to error), and doing it allows one to look at the Object *ohne mitzumachen*[6]. It is not the same as disbelief, or doubt: it simply means that knowledge of facts is no longer relevant, and is put out of play. After all, all facts are

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[5]"To the things themselves!". This is not the realist slogan that it sounds. The "things themselves" here are the phenomena.

[6]"Detachedly; without participating".

merely contingent, and as such are not relevant to the uncovering of the essential meaning of the phenomenon. One should simply notice that a judgment has been made, neither adhering to it or disagreeing with it.

> "This reduction...is not intended to restrict reality, but precisely to unfold its structure." (van Peursen 1959/60:181)

So the aim of the first stage of the reduction is simply to accept, notice and describe in a detached way whatever presents itself to consciousness: these are the phenomena, the reliable "things themselves".

Thus his famous "Principle of principles":

> "No theory we can conceive can mislead us in regard to the *principle of all principles*: that *every primordial dator Intuition* is *a source of authority for knowledge,* that *whatever presents itself in "intuition" in primordial form ... is simply to be accepted as it gives itself out to be,* though *only within the limits within which it then presents itself.*" (Husserl 1913/31:92, his emphasis).

The next stage of the reduction involves scrutiny of the phenomenon and the acts of judgment, etc, observed in the first stage. Their details can be varied in the imagination in an attempt to gain insight into what is *essential* to them.

> "Whatever facts present themselves serve only as examples similar in their most general aspect to the empirical illustrations used by mathematicians...", much as the examples of beads on an abacus can help us "to grasp with insight, and in their pure generality the series 2,3,4...as such, pure numbers as such, and the propositions of pure mathematics relative to them, the essential generalities of a mathematical kind." (Husserl 1913/31:11)

This stage involves a discipline of *doubting* reminiscent of Descartes' project. Husserl sees his reduction as a radicalisation and extension of the Cartesian doubt. Descartes set out to discover what could not be doubted, and must therefore be indubitably real, or true. He stopped when he reached the Cogito, the indubitable non-physical thinking self linked to the physical body. Husserl agrees that consciousness is the "fundamental indubitable", but finds it necessary to go further, to analyse the structures and acts of consciousness itself, and come to an understanding of its essential nature, rather than stop with the fact of its existence.

As part of the reduction, therefore, the philosopher must learn to suspend all the merely contingent facts of his own consciousness, not so much by doubting, as by putting out of play those aspects of consciousness that belong to him *as himself* - his particular personality, psychology and situation. In this way he can come to understanding of *pure* consciousness, gradually elucidating the essential structures of consciousness *as such.* This is the reason that Husserl's philosophy is often called "pure" or "transcendental phenomenology". He believes in pure or ideal essences which transcend any and all actual instances of existence. He believes then, that it is possible for a philosopher to achieve *intuition* of universals, *from examples*, though clearly from the description just given, it has to be done according to a rigorous method if it is to be successful.

Husserl gives rather few satisfying examples of exactly how the reduction should be carried

out - though he often refers to the fact that it is strenuous and difficult, and requires great mental discipline and rigour. He himself seems to have been quite astonishingly rigorous in pursuing this course of philosophical thinking, though his results could hardly be counted as successful in terms of their original stated goal. The ultimate aim of all the work, it will be remembered, was the building up of a reliable philosophical structure. Husserl, however, never finished digging the foundations. His 50-year career was a continual process of revising and re-questioning, a deeper and deeper archaeology (a term he would in fact have liked to use for his philosophy, if it had not already been appropriated by another discipline (Spiegelberg 1982:76). At the end of his life he claimed only to be a "true beginner", expressing confidence in his achievement only to the extent of claiming that, were Methuselah's span of days allotted to him, he might attain his goal from the starting point he had reached (1913/31). He certainly hoped that his work would be carried on after his death by his followers - especially Heidegger - but as will be seen below, this was not to be.

My focus here on the reduction should not suggest that this kind of analysis was all that Husserl did. The method of reduction only makes sense within a philosophical framework which supports and interprets it. Much of Husserl's work had to do with the elaboration of such a framework. The style of Husserl's thinking meant that this framework underwent considerable change through his career, as he struggled with problems of consistency and strove to correct the misunderstandings to which his work was prone. This, together with the fact that by his own admission his language is "so difficult, even for Germans" (Husserl 1913/31:30), giving rise to numerous issues of interpretation, makes his philosophy extremely difficult to summarise in any way that does justice to the intricacy of his thought. Below I will attempt a very general characterisation of some aspects of his philosophy that are particularly relevant to the present discussion.

Before doing so however, it might be useful to dispel some possible misunderstandings. Each has an element of justice as a criticism of Husserl's philosophy, and they have in fact been important in the development of phenomenology, as will become evident later in this discussion. But a proper understanding of Husserl's philosophy requires that these criticisms should not be made lightly or simplistically.

First, though Husserl's philosophy is in some ways idealist, it is not a caricature idealism in which all that exist are ideas, and the external world is a mere fiction, or creation by the mind. He believed, as explained above, that it is impossible to separate conceptually the world and the consciousness that knows the world: the unities of perception are thus partly conditioned by the unity of the world. Neither is the ideal for Husserl something that *literally* exists separately or distinctly from the real or actual, as in Plato. The real and the ideal are inseparable in Husserl's philosophy; the real *becomes understandable* according to its (own) ideal meaning.

> "According to Husserl, fact and 'essence' are inseparable in experience. Every fact, in order to be understood, must be brought under an eidetic law which defines its essential meaning-structure..." (Edie 1976:65)

Secondly, it is quite unjust to dismiss Husserl's phenomenology as mere subjective description and introspection in the derogatory sense that it is just a matter of looking around and describing what appears in the first words that spring to mind. Husserl's quest was for essential universal and transcendent truths. His reasons for starting with phenomena and his method of using them were rigorously worked out. "Subjective" as he used it never meant "relating to a particular personality" but rather "relating intrinsically to (pure) consciousness as such".

Finally the problem of solipsism in Husserl's thought should be raised. His philosophy of pure consciousnesses constituting their own realities has often been criticised as being incapable of explaining any intersubjectivity or communication, or even true knowledge of the existence of others. This caused Husserl a good deal of exasperation during his lifetime, since he felt that it hinged on a misunderstanding of his work. For one thing, part of what is revealed in the reduction is the existence of co-transcendental fellow-subjects, a "transcendental society of 'Ourselves'" (Husserl 1913/31:21-22). Each consciousness is aware of the existence of others which are assumed to be similar to itself.

> "Whatever holds good for me personally, also holds good, as I know, for all other men whom I find present in my world-about-me. Experiencing them as men, I understand and take them as Ego-subjects, units like myself ... in such a wise that I apprehend the world-about-them and the world-about-me objectively as one and the same world ..." (Husserl 1913/31:105)

The constitution of the world by consciousness did not mean that each consciousness has its own reality. The point of the reduction was to uncover the *essential* meanings that something *must* have in order to be perceived as what it is. The system of meanings was ideal and objective, in the sense that it did not relate to a particular instance of use.

> "The world has this meaning whether we are aware of it or not." (Husserl 1913/31:22)

For another, the personality of the Subject was only *suspended* in the reduction, not doubted or denied. Again the point was to find out the essential characteristics that any consciousness must have, not to say that those were its only characteristics, or that all consciousnesses were identical.

Now I would like to look in a little more detail at two aspects of Husserl's philosophy which are particularly relevant to present concerns: perception and language.

3.2.2. Perception in Husserl's Philosophy

Husserl's philosophy implies and incorporates a certain kind of attitude to perception, and an account of perception was an integral part of his work. It is however an attitude which is prone to various traditional philosophical problems, and the details of his account changed considerably through the phases of his career, in response to these. So, once more, this section aims only to present the overall style of his approach.

Actually, Husserl's account of the perception of Objects has already been prefigured to some

extent: the explanation above of the method of reduction can be seen as an undoing or working backwards of the acts of perception which give the Objects of the Natural Attitude. Everyday perception can thus be seen as the result of acts or processes carried out on a phenomenon. In this respect Husserl's understanding is somewhat similar to that of cognitivism. The similarity should not be overstated, however. We might note first the central role of Subjective consciousness in constitution of the phenomenon. The phenomenon is in no way like the "sense data" or "cues" of traditional accounts of perception (of which cognitivist philosophy's is a development). The Subject's experience is necessary as the source of the meaning of the phenomenon. Objects thus are meaningful from the "lowest level", which is not true of accounts in which Objects are built up from meaningless "sense data" which must at some stage be given meaning, or converted into meaning.

A problem of course is how to characterise, or even account for the constitution of the "original" phenomenon. This Husserl does by proposing intentional acts, sometimes taking several steps, which occur "below" the level of the phenomenon. Thus intentionality objectifies, unifies and relates "hyletic data" (Spiegelberg 1982), which *are* in some respects similar to sense data, although more like "stuff" than atomic facts or features. Husserl is not entirely happy with this solution, and the details change, but the general picture of acts of consciousness constituting objects through a series of stages, some relatively passive and some relatively active, is characteristic of his approach (Spiegelberg 1982). Here perhaps there is the possibility of greater similarity with cognitive science - I discuss this further below.

So things experienced are brought under concepts, to be perceived as what they are, *ie* according to their essential meaning. These concepts are part of the essential structure of pure consciousness-as-such, inherent in every Subject. The view that consciousness and Object are correlates means that perception can be seen either as *classification* of things according to their essence; or as *realisation* of concepts by actual things (*cf* Sajama and Kamppinen 1987). In this respect, too, Husserl's view comes close to cognitivist philosophy's account of recognition as resulting from both top-down and bottom-up processes - the "incoming" features determine which stored representation will be accessed, and the stored representations determine how the sensation will be perceived, which meaning it will be given.

Another problem for an account like Husserl's is that of how to explain the fact that in perception we always seem to go beyond the immediately given. In only a minority of cases is the Object perceived as self-evidently given in its essence - in fact, this really only happens for certain kinds of reflective perception. In the usual case, for example in seeing a three-dimensional Object like a cube, house or tree, we can only see one side at a time, and yet it is part of the essential meaning of the Object that it has other sides. This Husserl deals with using the notion of *horizon* and co-presentation. Generally, things are not perceived alone and in isolation from other things. There is always a horizon of less reliably given objects, or aspects of the same Object, present at the same time. Our awareness of these

helps us to anticipate the next perceptual events, so that we never come to them completely cold: they are *adumbrated* to some extent. Here again, then, it is possible to see some similarity between Husserl's view and that of cognitivism.

3.2.3. Language in Husserl's Philosophy

Language as such is not a central interest of Husserl's, though naturally it does come up as a topic of discussion. We have just seen how he stresses the role of Subjective experience in making perception meaningful; the same is true in Husserl's account of language. He is interested in

> "the queer manner in which words ... bow themselves off the stage ..., and merely serve to introduce ... objects and connections other than themselves ... and to what extent knowing or cognizing an Object consists in putting the right name to it, seeing it as *called* this or that. All this has many points of affinity with recent linguistic philosophy, but it is also profoundly different. For recent linguistic philosophy ... sees meaning only in the varied use made of words and combinations of words in many natural and social situations. This ... is of course both valuable and necessary, for ... a life of meaningful references that had no 'fulfilment' in responsiveness to what environs the person, would be ... impossible. But ... [for Husserl] a personal appropriation of meaning, a lived-through understanding of what it is that words are naming or communicating, is a central feature of the meaningfulness of words, and ... in default of it, there could be no more genuine semiosis than there is in the case of a computer or taperecorder." (Findlay Introduction to Husserl 1900/1970:4)

So, as well as the important difference that all meaningfulness is grounded in experience of the Life-world, there are some significant points of similarity between Husserl's and cognitivism's understanding of language[7]. There is a definite, essential meaning associated with, but separate from, each word-form. This meaning is objective, in that it does not vary according to the particular person using it, or situation in which it is used. These meaningful words are related in a logical system somewhat like de Saussure's *langue*, with a distinction between "expression" and "indication", rather analogous to that between sense and reference.

As for sentences, statements have logical relationships to aspects of the world that make them true, false or meaningless (anomalous). Husserl shows less interest in other sentence types, or in communication and language in use.

> "Husserl's interest in language was primarily that of a logician interested in the omnitemporal and objective laws which are necessarily presupposed in any act of linguistic expression." (Edie 1976:xi)

[7]This similarity is rather evident in Verhaar (1970, orig. 1966), in which disagreements between Husserlian phenomenology and structuralist linguistics are discussed. Many of the points raised are similar to Chomsky's.

3.2.4. Discussion

At this stage, a brief pause is in order, for some preliminary comparisons between the cognitivist and phenomenological philosophies. The vast differences of style and problematic between cognitivist philosophy and Husserl's "pure" or "transcendental" phenomenology - even in the heavily watered down version I have been able to give here - must make it seem unlikely that they are even commensurable, let alone that there are any similarities. However, I hope in the course of this discussion to show first that the major insight of Husserl's philosophy is of crucial importance to cognitivism; and second, that one of the reasons that Husserl failed in the end to provide a satisfactory philosophical framework is that his position is too similar to, rather than too different from, the traditional philosophical view he argued against, and of which cognitivism is an extension.

It will be recalled that I ended Chapter 2 with two kinds of criticism of cognitivist philosophy. On the one hand the nature of the Subject postulated was inadequate: the symbol-manipulator could not perform the tasks required of it without the aid of a homunculus, since there was no way for the symbols to be meaningful to the manipulator. On the other hand, relatedly, there was insufficient consideration of the distinction between *existence* and *existence-as*. This was not a naive equation of the two: cognitivism recognises that large objects do not simply exist as what they are without a Subject to interpret them as such; but it does assume that small objects or features must be available as "raw data" for the Subject to construct the larger objects from.

The second point of this criticism can now be phrased in Husserl's terms, by saying that cognitivist philosophy is a philosophy of the Natural Attitude: it accepts (some) Objects of perception - including those of scientific perception - as if they were given, without enquiring sufficiently into their provenance. Husserl's insight about the role of consciousness in the constitution of things as what they are is thus a very important one for cognitive science. His distinction between *existence* (of a thing) and *essence* (of an Object) is precisely the distinction between existence and existence-as that came up in the discussion of Chapter 2. Husserl's argument that the role of Subjective consciousness in existence-as is unavoidable is thus relevant to cognitivism. Objects are what they are only in relation to a Subject, as they are meaningful in the Subject's Life-world, not in relation to some pre-defined "sense data".

This view thus also overcomes the problem I posed for cognitivism of accounting for the meaningfulness of the Objects its Subject constitutes from meaningless "cues". For Husserl, Objects must always already be meaningful in order to be Objects for a Subject. The "lowest" level of perception is the *phenomenon*, to which both Thing and Subject contribute. The World the Subject experiences is the Life-world, not the world of science - atoms, light rays, sound waves and so on.

Husserl's and cognitivist philosophy's perspectives can perhaps be compared by looking at

their attitude to the choice between realism and idealism. It will be recalled that cognitivist philosophy's breakthrough in finding a way out of the dilemma posed by behaviourism and introspectionism (the manifestations of the realist/idealist poles most relevant in their history) was their version of monism. They felt it very important to choose the realist pole, in the hope of avoiding a dualist ontology. They were able to do so without losing the ability to account for complex, creative behaviour, by virtue of the additional power they could give it with the computational analogy.

Husserl's reaction to the dilemma was very different. He sees both poles as equally objectionable in resting upon an assumption of independence of Subject and Object. Cognitivist philosophy's variation on the theme of realism would not impress him. He sought *not* to settle the problem one way or the other, but to overcome it by understanding its cause. The reason it is difficult to choose between them is that both poles have something of truth about them: the Subject and the World are both implicated in the constitution of a meaningful Life-world.

In this insight, I believe, Husserl's philosophy is of crucial importance to cognitivism: it is the key to undestanding and solving the major problems I raised at the end of the previous chapter. However, the results Husserl attained with his insight are in some respects not very encouraging. As we have seen, his quest became a never-ending "archaeology". The reliable foundation he required was never attained.

It might seem natural then to doubt the wisdom of this inclusion of the Subjective in a philosophy. Whatever the side-benefits of Husserl's quest in philosophical insights (which I have not brought out at all in my summary, but which are widely acknowledged), so far as his central, motivating quest is concerned, his focus on Subjectivity led to failure. Certainly so far as cognitivist philosophy is concerned, his work must seem, in comparison with their own, hopelessly lost in unverifiable speculation, and totally unworkable: hardly an attractive alternative, no matter what the gains to philosophical truth of abandoning the Natural Attitude.

However, I believe such a response is overly hasty, in leaping to the conclusion that it is concern for the Subjective that is the cause of Husserl's problems. Husserl's apparent failure should not lead us to abandon any consideration of the Subjective. Far better to try to uncover what are the real causes of the difficulties.

One way of looking at this situation is to consider the reason that Husserl wanted to include the Subject in the first place. His motivation, as has been stressed, is a quest for increased certainty - the reliable, necessarily true foundation from which he could build in a principled way an edifice of guaranteed truth. He looks for a reliable method for discovering real, definite, enduring essences, such as those of mathematics, where, in Husserl's estimation, the essential nature of numbers and their relations is definite, discoverable and indubitable. His task as philosopher then is to specify what the essential meanings of the world are.

Clearly, any essential meanings of perceived objects are not obvious from their surface characteristics, which vary so greatly. Therefore, Husserl concentrates on abstract or formal characteristics - of the kind which remain the same despite surface differences. His work as a philosopher involves specifying what are the abstract formal essences of the things he encounters in the world[8].

This amounts to a prejudice which values the abstract, ideal essence as more "real" than the actual characteristics of existence. So despite his insistence that the ideal realm of concepts and the real world of things are inseparable correlates, Husserl works almost as if the ideal were more real: the domain of greater truth and reliability, to which appeal can be made in explanations, proofs, etc; and from which extrapolations are made about the world. Thus he can be seen, perhaps, as a "methodological", though not an "ontological" idealist (Sajama and Kamppinen 1987). Non-essential features, actual characterisitics in space and time, are to be ignored as irrelevancies or even hindrances to understanding of essential truth - the true is timeless, unambiguous and definite.

This focus on abstract, formal characteristics of Objects is closely linked to the kind of Subject that Husserl postulates. The pure transcendental essence of the Subject's consciousness has definite and enduring structures. Only if that is the case can a focus on the phenomenon as the foundational level of truth be justified. Since it is the case, as far as Husserl is concerned, an important criterion of "truth" is immediate "presence" to consciousness of something, in its essence. If something is immediately present, there, to be observed - whether an external Object of perception or an internal act of perception - and apprehended fully in its essence, then it must be accepted as true.

These remarks might strike a chord of recognition from the discussion of Chapter 2, where cognitivism was characterised by its ability to account for intelligence as the formal processing of formal features. Despite the many differences between Husserl and cognitivist philosophy, I was able, in setting out Husserl's treatment of perception and language, above, to remark on several points of similarity between the two philosophies. These similarities might have suggested that there are similarities at a deeper level as well, and that, I believe, is the case.

Certainly cognitivist philosophy does not search for an absolute foundation: as was seen in Chapter 2, it incorporates the Kuhnian view that truth is relative to pretheoretical assumptions, and sees its own foundation as a kind of "working hypothesis". But I showed at the end of Chapter 2 how the version of monism espoused by cognitivism operates to impose a kind of notional foundation around the descriptions of the natural sciences. This, I

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[8]We saw above that Brentano's move had been very similar, in his insistence that mental events are as real and important as physical ones. His next step was to establish a definite ontology (real things and real thinkers, but nothing else); theoretical distinction between types of entity (intentionality); criteria for a method of investigation (infallibility of inner perception); classification of mental events, and so on. He however did not have Husserl's degree of self-questioning.

argued there, affects the cognitivist understanding of Subjectivity: there was an implicit assumption that a physical or formal description was somehow neutral, so that at the "lowest" levels of perception, Objects ascribed to the Subject were those of the physical description; and the rules according to which representations were transformed were those of logic and mathematics.

Though Husserl's philosophy is importantly different from cognitivist philosophy in acknowledging the crucial role of the Subject in the constitution of Objects as what they are, looking more closely at the nature of the Subject he postulates suggests that it is not in the end so very different from the one I have argued is implied, or presupposed, in cognitive science.

Husserl's Subject too lives in a world whose essential meanings are already definite; whereas in cognitivism they are given by science, in transcendental phenomenology they are given by a postulated pure consciousness. Other meanings, like those of everyday life are derivative, obtained by transforming the pure essential meanings into something else. In both cases, the same kinds of questions are begged as to where these essences come from; how the definite, systematic structures come to be there in the world - how the philosopher's own work can be explained in terms of the Subject he postulates in his theory.

There is thus a belief - or hope - in the reality of some "foundational" level of description which I am now arguing lies behind decisions as to the nature of the Subject each philosophy postulates, and thus influences its account of perception, language, and the rest. The fact that cognitivist philosophy and Husserl share this belief accounts for other similarities. The two philosophies discussed here share some deep commitments that give them a similarity of structure and emphasis despite their very different surface appearances. In both, the paradigmatic case of perception is that of the Subject standing back and observing a thing from one angle and then another; consideration of language in use for communication is secondary to study of language in its essential nature as a logical system of meanings. It seems in fact rather likely that if the transcendental framework were pressed into an experimental programme with the same criteria as cognitive science's, it would soon be pushed into statement of "acts of consciousness" in explicit rules, representations at different levels between "phenomenon" and "object of perception", and "horizons" consisting of atomic facts and propositional knowledge arranged in some systematic structure. The similarities then would be more striking.

The fact that Husserl maintains this belief in the possibility of a reliable foundation while giving a role in constitution of Objects to the Subject is, I believe, a reason (combined with his extraordinary rigour and self-critical faculties) for the bottomless archaeology that his philosophy became. Giving the role of constitution of Objects to the Subject does mean losing that kind of reliable certainty and controllability.

So the present analysis has shown that bringing in Subjectivity of a kind that allows the

possibility of a reliable objective foundation to be retained does not sufficiently address the problems I raised at the end of Chapter 2. It does not change the deep features of the philosophy that underlie, and in a sense, cause the problems. These are reasons then for not responding to the criticisms of Chapter 2 by incorporating Subjectivity like Husserl's into cognitivist philosophy. They are not, however, reasons to reject the argument that Subjectivity should be considered at all. An explicit, defensible account of Subjectivity *is* necessary to a science of cognition - all that has been shown here is that it should be Subjectivity of a different kind from Husserl's.

Fortunately, Husserl's successor, Heidegger, addressed very fruitfully precisely this issue of the nature of Subjectivity, and came to a very different philosophical framework, which overcomes these problems I have discussed. It is his work that I will discuss next.

3.3. Heidegger

3.3.1. General Philosophy

Martin Heidegger (1889-1976), also German, began as a student of Catholic theology in Freiburg, before changing in the later part of his studies to secular philosophy. He was apparently impressed by his first acquaintance with Husserl's work, which was through his writings. By the time they met personally, though, years later, Heidegger had come to some fundamental disagreements with Husserl's approach to philosophy, and was developing his own ideas along very different lines. However, they worked together for some time, and Heidegger's major work, *Being and Time* (1927), was dedicated to Husserl.[9]. Husserl's view was thus very influential to Heidgger's philosophy, even if only in the negative sense that it was in part as a reaction against Husserl's philosophy that Heidegger's was worked out.

Perhaps the major point of Heidegger's disagreement with Husserl was over the nature of the Subject in his philosophy. Where Husserl postulated that the world could be known only in relation to a transcendental consciousness, Heidegger argued that to know, a Subject must first *be*, and be the kind of being that *can* know. It is therefore necessary to ask "What kinds of beings can know? What different kinds of beings are there? What characteristics must a being have to have the possibility of knowing?"

So Heidegger believed that the starting point of philosophy should be the addressing of the question of the meaning of *being*. Not just Husserl, but all of traditional philosophy, he argued, had missed the point by not asking this question. Of course, he acknowledged that there had always been a branch of philosophy concerned with the study of being - ontology - but the problem addressed had been to do with *what* exists, rather than *how* (whatever

[9]There is some controversy regarding whether Husserl was fully aware of the extent of Heidegger's disaffection, since he nominated him as his successor to his position in Freiburg, apparently in the hope that his project of transcendental phenomenology would be continued.

exists) exists. This is because philosophy has always been more concerned with knowing than with being; with questions like "What (kinds of things) can we know about?"; "How can we know things?"; "How can we be certain about what we know?". The study of being has therefore been very limited. Insofar as it has been studied at all, for example, it has been as an extension of the verb "is", with no attention paid to the first person "am".

From this starting point, Heidegger elaborated a rich and profound philosophy, which, once more I will sketch in the most general terms. Heidegger was actually interested in the nature of Being in general and many different modes of being; however in the course of achieving this he undertook a detailed analysis of human being. It is on that analysis that I will concentrate here.

As in Husserl's philosophy, the method was an integral part of the study. The problem for Heidegger's approach, of course, is: if being is prior to knowing, how can it ever be known about or investigated? It is not possible to use any of the usual ways of knowing or being certain - since it is no longer clear what their foundation is. Clearly it would be counterproductive to start from some apodictic truth and build up by means of rational inference and deduction. To do so would be to use criteria of truth which presuppose facts about or attitudes to being - which is what is being investigated.

Heidegger's method is called the **hermeneutic method**. Hermeneutics is a branch of study with a long history of its own (see, *eg* Nicholson 1984, Mueller-Vollmer 1986, Radnitzky 1970). It can be summarised as the study of interpretation, especially the interpretation of texts, and has its origins in the exegesis of works of scripture, and the study of judicial decision-making. Interpretation is meant here in the sense of making explicit or articulating an understanding that is already there, though in a dimmer or vaguer form. The most famous aspect is the concept of the **hermeneutic circle** as a model of the process of interpretation: one starts first with a global, though vague understanding of the text to be read, and its context, and some implicit expectation as to what it will be about. Within the context of this initial understanding, certain details stand out as salient or especially meaningful, and attention is directed towards some particular parts of the text. As these become more clearly understood, one's understanding of the whole shifts somewhat, and needs to be reconsidered. With the new attitude to the whole, the significance of some of the parts changes or becomes clearer ... and so on in a circle or spiral of indefinite duration and ever-increasing understanding.

The keyword in this method, then, is *explication*, rather than *explanation*:

> "...basic assumptions [are] not so much built on and away from...[as] filled in in more detail, and interpreted to a higher level of explicitness." (Bateman 1983:37)

Importantly, the vague, non-explicit understanding that a person has of a situation can never be made fully explicit. With work, aspects of it can be brought to awareness, and spoken about in propositional form. But *complete* explicitness is unattainable, since the whole can

never be completely seen from any one perspective. Thus, most importantly, such understanding does not, and could not, exist originally or primarily as explicitly formulated knowledge. Making explicit requires acting upon the inexplicit or vague understanding; it necessarily involves losing something, or abstracting away from the real situation. The decision as to which aspects to leave out and which to retain requires the understanding of the whole.

Far from being therefore a poorer or weaker method than one which relies on external criteria, or a fixed background understanding, its strength lies in the very fact that it accepts that no individual fact can be guaranteed in a universal or external way, but only in relation to a particular understanding. According to this method, we increase our understanding of something by looking at it from various different angles to see how it appears according to a range of different background assumptions.

> "The circularity of its problem is not a secret weakness at the heart of philosophy, but is its distinction. The task is not to avoid or repress the circle, but to find the right way into it." (King 1964:32-33)

> "We can never make all the assumptions explicit, but something is won if we are aware that there must be such assumptions." (Radnitzky 1968:25)

This then is the kind of approach Heidegger takes to his questions about human being. He reasons that human beings clearly have some understanding, however dim, of the various modes of being - as evidenced, for example, by their ability to differentiate them, and treat them appropriately - and that this dim understanding can be explicated. His analysis aims to articulate and explicate this vague understanding.

Our experience of our own being shows it to be embodied, mobile, experiencing, communicating, situated, engaged, and so on - anything but the detached observer of Husserl's phenomenology. Heidegger's analysis shows that far from being founded in, or superimposed upon, rational, explicit, "knowing" of essential meanings, these characteristics of being are the condition that allows us to have any knowledge of essences at all. Indeed, it is the condition of there being any essential meanings. To make the world of Things into a world of Objects requires a Subjectivity of Heidegger's kind, rather than of Husserl's kind. From this perspective, to suggest that the actual existence of the Subject is in some way irrelevant, or a hindrance, as Husserl's reduction does, is absurd. Husserl's idea of a transcendental consciousness constituting objects thus makes no sense; it would be nearer the truth to say that such a consciousness is itself constituted, an abstraction (*cf* Spiegelberg 1982). Husserl's reaction to this argument was that in taking this approach, Heidegger remained stuck in the natural attitude, and his philosophy was in danger of being confused with anthropology. This dispute between them was never resolved. The two approaches are incompatible.

Heidegger's interpretive analysis is thus concerned (in part) to point to the characteristics of human being which are its necessary qualities, not simply in cognising essential meanings of

the world, but in creating or bringing into being those essential meanings. Some aspects of his analysis, in outline, are the following.

Human being is being-in-the-world. This is a similar point to Husserl's one that Subject and Object are inseparable. Neither the being nor the world is separately describable or definable, or even possible to speak about in abstraction from the other. Hence Heidegger's use of the hyphenated phrase. But for Heidegger, we are *in* the world in a special sense - not as a pea is in a pod, or a cube is in a box, but fundamentally *involved*.

The most fundamental characteristic of human being, he finds, is that it is *interested*: it has an attitude of care towards its own being, and indeed other kinds of being. It engages in projects which arise out of this attitude - though it is important to emphasise that not all such projects are voluntarily and rationally chosen. There is a sense in which we are "thrown" into situations in which we must act, and in which projects take form. It is against the background of this engagement that things in the world emerge as meaningful - in relation to the role they can play in our projects. Things are thus known primarily not in a detached way, to be rationally observed and described, but rather as tools or equipment to be used ("to-hand"). Only secondarily, in the event of a breakdown or other kind of problem, do we encounter them in their other mode of being - as objects of contemplation and analysis ("at-hand"). Objects thus get their being (not necessarily their existence) in relation to the Subject. In their original to-hand being, tools are not even encountered as so many separate bits and pieces, but rather as parts of an interconnected whole.

Another fundamental characteristic of human being is that it is being-with other people. The world that we are in is an intersubjective one from the start, and communication with others is basic to our own being. Communication here means "discourse" in the most general sense; verbal exchange of information is far from the only or even the central kind of communication. It can only occur at all on the basis of a more general kind of understanding or empathy such as one human being has for another's being.

One of Heidegger's major preoccupations is the explication of human being's attitude to time. Time is one of the things that has been most thoroughly objectified and rationalised in the tradition of philosophy, so that we tend to think of it as occurring in an even flow, from a past gone behind, through an instantaneous present, and into a future still to come ahead. Time as actually experienced by human being however has a very different structure. Our being is fundamentally oriented towards the future, and the past remains with us in the present. Thus historicity and contingency are not additional to, or flaws in, a timeless ideal nature, but rather necessary conditions of the Life-world. It is our orientation towards the future gives us a sense of our possibilities which in turn gives us the ground out of which the projects we undertake grow - and it is these projects with respect to which the meanings of the world emerge.

One of the things that faces us most starkly out of the future, according to Heidegger, is the

possibility of our own death. This makes a sense of *dread* a deep characteristic of human being. Since dread is an uncomfortable feeling, we tend to suppress or disguise it in various ways. This has the important result that such attitudes or feelings, which might previously have been brushed aside as an irrelevant factor to do with individual personalities, and thus the domain of psychology, or even psychiatry, are for Heidegger integral to our being as humans, and thus to our very ability to know anything at all.

This tendency of ours to ignore or suppress knowledge of our own death and finitude has, Heidegger claims, some important consequences. Forgetting these facts allows us to ignore our own being, and our role in the constitution of the meanings of the world. The easiest way to live is to accept the "ground" of appearances given to us by our society and language. This might mean for example accepting as "real" or "true" the "essential" meanings we perceive in Objects; or the categories defined by our language. To do this however, Heidegger claims, is to be in a sense "inauthentic". If one were living in an authentic way, one would be aware always of the provisional and contingent nature of the "real" and the "true": its dependence, in a sense, on oneself.

Clearly, there is a major change here from Husserl's "phenomenology". The phenomenon being studied is not the pure essence of things as they appear to transcendental consciousness. In fact, for Heidegger, Husserl's "essences" are derivations or products; the interest is not in the products but in the process whereby they come to be. Similarly, Husserl's method of reflection is for Heidegger a *deficient* mode of being. Heidegger's phenomenology is not a forcing, but a letting - letting things reveal themselves as they are, in their own being. Where Husserl believed that formalisation and specification of essence were necessary to philosophical clarity, Heidegger believes that these are impossible to achieve with any completeness, and in any case remove one from the scene of interest, to focus on the abstract, partial and derived. Even regarding a tool as an at-hand object, for example if it has broken, is a secondary and deficient mode of contemplation for him. Knowledge, for Heidegger, is not primarily detached, factual or eternal; nor is truth a matter of logical implications, ahistorical and non-contingent. These kinds of systematic knowledge are useful, but always necessarily derived as an abstraction from a kind of knowledge better thought of as know-how, wisdom, understanding or insight. Thus the role of the philosopher is not to give "knowledge", but to cultivate insight and understanding.

In the middle part of his career Heidegger's philosophy underwent a "turn". There are various interpretations of the exact nature of this *Kehre*, but it seems that he became less interested in analysing human being in the manner discussed here. He became dissatisfied with his own earlier work, seeing it as still too stuck in the traditional mode of philosophy, and in fact never completed the concluding part of his main work *Being and Time*. His later works were mainly shorter pieces, often using various poets' work as topics, and much more difficult to understand. Fortunately this later work is not relevant to the concerns of this thesis, so I can safely leave it aside.

3.3.2. Language in Heidegger's Philosophy

Language obviously occupies a completely different place in a philosophy like Heidegger's from the one it has in a philosophy like Husserl's. It is not a system that is separate or abstract in relation to other aspects of human being. It is central to and integrated with them. Language is fundamentally a characteristic of human being; to see it as an entity in itself is to make it into an at-hand object.

So language for Heidegger is not a clearly defined, unified system existing separately from the situations in which actual utterances are made[10]. In part, it is one kind of tool that is available for our use. It is also, in part, (only) one of the kinds of discourse that we can enter into with others. And words are only one of the kinds of things that can be meaningful for us. Language "works" only within the context in which it is used; and only because it is used within a context, where the parties share characteristics and understandings.

Language is certainly not primarily an ideal logical or formal system. Meanings are not "objective" essences attached to linguistic forms. Of course, language as a tool can be contemplated in an at-hand way, by standing back from it and making it into an Object. But this can only ever be a secondary and an incompletely achievable step and must rest on the prior understanding gained within real situations. It is by taking this step that traditional thought has come to separate the forms and contents of words, or to take the literal statement as the paradigm of linguistic expression. But these are abstractions, and give a very limited picture. The phonetic form is only one of the things that makes a word meaningful. Being literally true or false is only one way for language to relate to the world. The truth of an utterance, like its meaning, is given to it by the situation in which it is used. Thus the distinction between a literal and metaphorical use is another that is only available to an at-hand contemplation of language.

> "...such a rendition of meaning places the focal point of meaning not in the words, but in [human being].
>
> There is a large and impressive tradition, especially in English-speaking countries, that would take serious issue with this claim of Heidegger's. It is usually thought or argued that only words or propositions have meaning. In order for an act or occurrence in the world to have meaning attributed to it, it must first be articulated in some form or other. Heidegger, however, denies this. His claim is that word-meaning is a derivative form of meaning." (Gelven 1970:96-7)

It is through expression in language that we *articulate* our pre-theoretical or inchoate understanding of the Life-world. Communication is thus a making explicit and refining of a more general kind of discourse between Subjects who share enough of this kind of understanding to make such discourse possible. Thus a language actually incorporates a

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[10] "The question of the essence of language has to be consigned to the silence in which new paths in language are opened up. Hankering after a conceptual grasp of the essence of language as a whole is an aspect of [human being's] inauthentic yearning for a wholeness that denies his finitude, for a presence to truth that is a truth of language in general without being a truth in a particular language, for a hermetic closing of the hermeneutic circle of his existence." (Llewelyn 1985:27)

community's background understanding within it. In this way it can be a tool for us, saving us the work of building up concepts from scratch for every project. But it can also be a hindrance to us, since its existence tempts us to simply make use of it, taking over the average understanding of our community, rather than articulating our own understanding. Different communities have different languages, and different understandings of the nature of the world.

This conception of language is especially important for Heidegger's own work. A project like his, of uncovering or unconcealing, demands that he somehow escape the average understanding of the world that his culture has, ossified in its language. His explications therefore use all kinds of neologisms, hyphenations, revivals of "original" meanings (sometimes with contrived etymologies), etc, to jolt his readers out of their complacent attitudes, and allow him to step outside the traditional categories and assumptions. His philosophy is not concerned to argue against other points of view - to do so is to accept the terms of the language they are couched in - but rather to replace their vocabularies in ways that encourage greater openness - though not of course to replace them once and for all. As was seen above, Heidegger does not want his own vocabulary to come to be used in an "inauthentic" or derivative way. Understanding his work therefore is not a matter of translating his philosophy into "ordinary" literal terms, but of learning his language. Any account except his own is likely to be inadequate as an explanation of his thought.

3.3.3. Perception in Heidegger's Philosophy

Heidegger has reversed the degree of interest in language and perception that Husserl had. He devotes a great deal of his philosophical energy to language, and relatively little to "perception" as traditionally understood. He certainly offers nothing that could be called a "theory" of perception in the usual sense, since he does not accept the traditional understanding of what is to be "explained" in perception.

Characteristically, he refuses to separate perception off from other human abilities, and reverses the traditional order of thinking about it. To Heidegger, perception is a ground of knowledge, not a result of it. Certainly any classification into sensation and perception is a high-level abstraction from our actual encountering of things in the course of the practical tasks of our lives. Nor is there a status for anything like Husserl's "phenomenon". Stimulus, sense datum and phenomenon are all equally "at-hand" abstractions resulting from an attitude of reflection, necessarily incomplete and provisional. Importantly, they all depend upon, rather than cause , meaningful perception.

Some of the familiar problems of perception thus do not arise for Heidegger. Perception is never thought to be basically the detached observation of an Object from a distance, nor to occur in static, self-contained "acts". The Objects do not have meanings which the Subject has to discover or distort; rather the Subject constitutes Objects as meaningful in the

context. Understanding or using something is not dependent on "knowing" it in an objective way. Thus the problem of how what is "present" can be supplemented or filled out with what is known or anticipated is also irrelevant.

> "Ordinarily, 'what we hear in the first place are never noises or sound patterns, but the creaking wagon, the motor-cycle. We hear the column on the march, the tapping woodpecker, the crackling fire'. A rather artificial and complex attitude is needed if we are to hear a 'pure noise'." (Schmitt 1969:76, quoting Heidegger)

Perception is very closely bound up with language and culture. Our most common way of perceiving is in terms of the categories our language gives us. Part of the process of coming to live with greater authenticity is learning to see outside or behind these categories, rather than simply accepting them at face value, as if things *in themselves* had the essences they appear to have. It has already been pointed what an important effect this has on the use of language in philosophy, or meta-theory.

3.3.4. Discussion

Here I would like to continue the discussion from the end of Chapter 2, and Section 3.2.4 above. So far I have argued that, while Husserl's philosophy is different in many respects from cognitivism, it has some important similarities, which can be traced to a similarity of understanding of the nature of the Subject and of the World.

In Heidegger's philosophy, we have a very different kind of approach. Importantly, the Subject postulated is different from that in either Husserl's phenomenology or cognitivist philosophy - specifically, the criticisms I raised there do not apply in this case. There are no problems of explaining how non-meaningful things are converted into meaningful ones; or how a regular system of essential meanings came to exist prior to its use by the Subject; or even about how the philosopher's own philosophical activity can be explained in terms of the abilities attibuted to the Subject.

In the terms I have been using, the key difference between Heidegger's philosophy and the ones looked at above could be said to be that, while Heidegger has kept the crucial insight of the distinction between existence and essence, and the role of the Subject in constituting Objects with essences, he has focussed more on existence than on essence - given greater priority to the *actual* than to the *ideal*. If the real world in itself does not come packaged as Objects with essences, it is necessary to explain how there come to be such Objects; not to impose a system of essential meanings, and explain how it comes that they are not always apparent to Subjects. In Heidegger's view, this involves postulation of Subjects of the kinds outlined above. So here our existence as human beings with personalities in a community of others is seen as prior to our essence (as "pure consciousness", for example); and our *understanding* of other people and things is seen as prior to explicitly formulated *knowledge* of their essential meanings.

So by this move - change of focus and priority (or value) from essence to existence -

Heidegger has overcome the whole set of problems raised above. The resulting philosophy is one which allows a different understanding in many areas - language, perception, communication; insights which are preferable in some ways to the systems required by the more formal philosophies.

Heidegger's move, though clearly advantageous in these respects, is not without cost, however. The link between the nature of the Subject postulated in a philosophy, and that philosophy's assumptions about the nature of "reality" or the world has already been pointed out several times. Heidegger's "world" is not a "prepackaged and labelled" one, in the bad sense that the "world" implicitly presupposed by cognitivist philosophy is - which is also to say that it is one without objective essences or definitions. But to say this is to open the door to exactly the kind of uncertainty that cognitivist philosophy or Husserl fear: the fear that I have suggested is part of the reason for continuing to insist on formal, objective, reliable "symbolic processing" as the paradigmatic example of human cognition.

In short, Heidegger's philosophy takes away the foundations that Husserl (explicitly) and cognitivism (implicitly) rely on. The essence of a thing is now not something definite and enduring associated with a form, but rather something constituted in a meaningful situation by an understanding Subject. If essences and facts are not "there" in the world, merely to be apprehended by the Subject, but rather are constituted by the Subject, then they are indeed "subjective". If, in general, a Subject's perception is influenced by the language he uses, then the philosopher's own perception must be influenced by the language of philosophy. A philosopher's (or scientist's) view is as much a personal interpretation as is that of the Subject in the philosophy. All the foundational concepts we are used to relying upon, all the criteria of truth, proof and explanation, and all the methods of attaining them, become, with this one move, unreliable. Everything is thrown up for questioning; everything becomes open-ended, provisional and contingent. The familiar, obvious and taken-for-granted are to be made problematic. It is true that Heidegger does provide an alternative method for investigating the Life-world given his understanding of it: the hermeneutic method - but such a method is likely to be of little comfort to someone used to being able to rely on facts and proofs.

It would be nice then if the choice between these two kinds of philosophy were a completely open one. It might then be possible to opt for the one with the reliable foundations, and treat the insights of the Heideggerian one as relevant to other, perhaps more mystical, purposes. The problem, however, is that though it is easy to phrase an appraisal of Heidegger's philosophy in terms of his "taking away" the foundations that are there in Husserl or cognitivist philosophy, this is actually rather misleading. He is not taking away something that really exists, but pointing out that something that is sometimes assumed to exist, does not; or that something that is striven for can never be attained. The foundations and certainties of Husserl and cognitivist philosophy, far from being reliable, are the cause of their problems. Heidegger's insights, I believe, should therefore be taken very seriously by cognitivist philosophy.

It is now possible then to assess the relevance of Heidegger's philosophy for cognitive science. Many aspects are clearly desirable as features of a general philosophy of cognition - it provides a unified and coherent way of incorporating diverse insights about human nature, and it overcomes the specific problems raised against cognitivist philosophy. On the other hand though it is very difficult to see how it could be made workable as the basis of a scientific endeavour like cognitive science. Clearly it would be impossible to incorporate (somehow) a Heideggerian Subject into the existing framework of cognitive science, as a replacement for the symbol manipulator criticised in Chapter 2. Far too much is related to the Subject, and the repercussions would be highly unsettling.

Another conceivable possibility would be to make a radical change of philosophical perspective and take on Heidegger's framework as a whole. The problems of "workability" raised above are one reason not to take this course - but not the most pressing. A far greater consideration is that to do so would utterly contradict Heidegger's intention, and negate the thrust of his philosophical argument. We have seen the efforts he went to to avoid letting his terms and concepts become "foundational", to keep them from being used glibly or without insight. To take such an avowedly and explicitly antifoundational philosophy and use it as the foundation of a philosophical or scientific endeavour would be self-contradictory and self-defeating. Taking seriously Heidegger's philosophical insight, and using it in a science of cognition, would mean guarding against foundationalism, not instituting his insight as a foundation.

Again, then, as with Husserl's philosophy, a natural reaction would be to think that cognitivist philosophy's original doubts about the advisability of allowing subjectivity into the picture were quite justified; and again, my response is that this reaction is not the best one. For one thing, putting what are essentially technical criteria ahead of philosophical soundness seems a thoroughly wrong-headed way to make such a decision. Better to question the validity of the criteria themselves in the circumstances. For another, though Heidegger himself took his philosophical insights in the direction of poetry and perhaps even mysticism, I do not believe it is necessary to work at that frontier of his thinking. Other, more prosaic, aspects of his work are also worth working out in detail, and might allow more practical progress in relation to a science of cognition. A look at the philosophy of Merleau-Ponty will help me to develop this line of argument.

3.4. Merleau-Ponty

3.4.1. General Philosophy

Maurice Merleau-Ponty (1908-1961) is a phenomenologist of a rather different ilk from those already discussed, although his work was certainly a continuation of their project.

He was a Frenchman, and belonged really to a different cultural era, being part of the

intellectual and political world of Paris in the years around World War II: he was a close friend and sparring-partner of Sartre's. His educational background was quite different from those of the philosophers so far mentioned. He was well-versed in the human sciences - politics, history, anthropology, sociology, linguistics and language pathology, and especially psychology - as well as philosophy itself. He also seems to have had a milder, less "driven" personality:

> "There is in him little of that pioneering approach of the early phenomenologists or even of Sartre who preferred exploring the frontier to cultivating charted territory." (Spiegelberg 1982:572)

He is particularly useful from the point of view of the present thesis for two reasons: first, because he develops the insights of the first phenomenologists, and explores the implications of their work for various practical and theoretical problems; second, because he had far more contact with non-phenomenologists, and explained his work in relation to more familiar approaches, as well as with reference to phenomenology. In addition, his work is remarkably readable, comparatively speaking.

One caution that should be borne in mind, is that although he was undoubtedly a brilliant thinker, he seems sometimes to have been rather unscholarly in his reading of other people's work, attributing to them ideas they would not have recognised as their own. For example, he sees Heidegger as basically continuing the same themes as Husserl, who he also misinterprets as being far more Heideggerian than he really was[11]. And he seems to have read de Saussure with a rather congratulatory view of his philosophical sophistication, as well as coming to something of a misunderstanding of some of his basic concepts, *eg* langue/parole, synchronic/diachronic, etc. History however forgives Merleau-Ponty, perhaps because the quality of his own thinking was such that his misreadings brought about a productive synthesis of otherwise disparate views: in an important sense, Merleau-Ponty is thus combining and extending others' work.

A prominent feature of Merleau-Ponty's philosophy is his concern to overcome or transcend traditional dichotomies, most particularly the long-standing opposition between rationalism and empiricism[12]. He is at pains to show that holding the members of these pairs up as opposite poles offers a false choice, since at bottom, they each rest on an identical network of foundational assumptions. The rationalist pole accepts precisely the same split between an objective world and a detached Subjective consciousness as the empiricist - it just gives the Subject more work to do (*cf* Spurling 1977:25).

Merleau-Ponty presents arguments against the empiricist position, and the behaviourist

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[11]Merleau-Ponty works mainly from Husserl's writing, claiming to be continuing the train of his thought (if sometimes "pushing him further than he would wish to go"), though as will become clear, he is also greatly influenced by Heidegger. In my description of his thought here, I will mainly compare him to Husserl.

[12]With all their close relatives: intellectualism/sensationalism; materialism/dualism; subjectivism/objectivism; idealism/realism, and so on. From the perspective of Heidegger or Merleau-Ponty, they can all be seen as variations on the same theme. In the present discussion the terms can therefore be used rather loosely.

psychology which rests upon it, many of which are very similar in style to cognitive science's arguments against behaviourism. However the direction he moves in for an alternative is very different to that of cognitive science. Merleau-Ponty's arguments against theories of representation, the appeal to memory in the sense of stored knowledge, and the role of logical inference in cognition are just as forceful as those he brings against theories which give stimuli from the environment the main causative role in explanation of behaviour.

> "He attacks traditional empiricism on the ground that the 'sensations' which according to empiricists serve as the starting point of all knowledge are scientific abstractions, not objects of experience. ...'Empiricism' Merleau-Ponty sums up 'fails to see that we need to know what we are looking for, since otherwise we would not be looking for it; intellectualism fails to realise that we must be ignorant of what we are looking for, or else, once more, we would not be searching.'" (Passmore 1968:500)

In this opposition to both philosophical stances, Merleau-Ponty seems close to Husserl, but although in a surface way he agrees with Husserl's insistence on the interdefinition of Subject and Object, Merleau-Ponty's position is very different at a deeper level. He is in sympathy with Heidegger's strong criticisms of Husserlian transcendental consciousness, which he sees as being far too like the detached intellectual Subject of rationalism.

For Merleau-Ponty, as for Husserl, what is important is the relation of the Subject and the Object. One common way of studying a relationship is to define each of the elements first in its own right, and then move on to look at their interaction - but that approach is quite inappropriate in this case, since the elements of the relationship are involved in each others' constitution. It is the nature of the relationship itself which must be the primary focus. In Merleau-Ponty's view, the relationship of the human being to the world is best seen as a kind of dialogue - or "dialectic" - with both the World and the Subject contributing to a constantly evolving interpretation.

For Merleau-Ponty, as for Heidegger, however, the Subject's active, embodied, being-in-the-world of temporality, history and other people, is the ground of the possibility of there being any Objects, essences or formal descriptions. Thus,

> "he was forced to reject the one thing in Husserl's work which gave sense to all [the rest]: the transcendental ego[13]. For Merleau-Ponty, the fatal error of the 'intellectualist' philosophies ... was their failure to see that finitude, temporality, and carnality were not blemishes detracting from absolute Subjectivity, but were, rather the only terms on which truth was possible." (Schmidt 1985:42)

As "Subjects", we are not just conscious, but we have, necessarily, a nature, a way of being that is our own.

Merleau-Ponty's goal is, in general, more down-to-earth than Husserl's or Heidegger's - to study and describe human being in a way that increases our understanding of ourselves. The method in his case is close observation and analysis of lived experience and its meanings. So the definition of "phenomenology" is, again, different from Husserl's (though not quite the same as Heidegger's either): the phenomena being studied are not the radically

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[13]The "Ego" here is what I have been calling the "Subject".

"reduced" essences of perceptual objects, but lived experiences of the world; and phenomenology, for Merleau-Ponty, is not a withdrawal from the world, but an attitude to take to the world.

> "...the phenomenology which Merleau-Ponty professes ... is very different from what ordinarily goes under that name. Whereas for ... Husserl 'truth dwells in the inner man', Merleau-Ponty, like Heidegger, rejects the concept of an 'inner man'. Man, he argues, is essentially a being-in-the-world. Phenomenology, on Merleau-Ponty's interpretation, is an attempt to recapture the lived experience, to go back beyond science, back beyond all forms of propositional truth, to the world as we actually encounter it in perception." (Passmore 1968:499)

Along with this change, comes a profound change in Husserl's central concept of intentionality. Of the definition of intentionality really used by Husserl, Merleau-Ponty complains it is "too often cited as the main discovery of phenomenology" (Merleau-Ponty 1945/62:xvii). He finds the directedness-towards-an-object of consciousness neither a particularly new nor a particularly interesting suggestion. Instead, he attributes to Husserl a dual concept of intentionality: first there is the intentionality of acts of consciousness, which is voluntary and reflective; and secondly there is the more primitive "operative intentionality":

> "... that which produces the natural and ante-predicative unity of the world and of our life, being apparent in our desires, our evaluations and the landscape we see, more clearly that in objective knowledge, and furnishing the text which our knowledge tries to translate [*ie* interpret] into precise language." (Merleau-Ponty 1945/62:xviii)

It is due to the action of operative intentionality that the meanings of the Life-world emerge for a Subject. Its most important characteristic is that it operates before and (logically) prior to any conscious reflection by the Subject. It produces the "horizons"[14] of the always-already-there situations which are the ground of any self-conscious, reflective thought, and is the source of the unity and coherence of our lives and actions. Because of this operative intentionality, there is always already some meaning in every situation we encounter, before we reflect upon it or attempt to articulate it. Part of being a human Subject is to have this kind of prereflective intentionality as a source of meaningfulness. In Merleau-Ponty's famous recasting of Sartre's famous phrase, we are *condemned to meaning*: even the meaningless has meaning as "meaningless". Meaning is not something we can choose to avoid: no matter what we do, we are always already in a meaningful situation. "We never start from zero" (Spiegelberg 1982:568).

An important consequence of this non-unified intentionality is its implication for the self, or consciousness. Consciousness cannot now be pure and transparent to itself, and therefore self-evident. It is in a sense divided, and what we can say about ourselves is influenced by the limitations of perception and language in the same way as our descriptions of the external world.

It is most important to stress the role of the (living) body in the operative intentionality of a Subject. It is the body which projects our situation around us, which gives us space,

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[14]Note the development of meaning from Husserl's 'horizons'.

distance, perspective and time, and the pre-reflective, ante-predicative, non-explicit "intentionality" from which perception begins. Thus it is our ability, through our bodies, to perceive that is the ground of all further reflective, explicit or abstract knowledge. Clearly, then, one of the dichotomies Merleau-Ponty's philosophy refuses to recognise is that of the body from the mind. One of Merleau-Ponty's books is called "The Primacy of Perception", and that is a good summary of his view. We are always already perceiving, before we "know" anything in terms of essences, facts or propositions; it is on the basis of our perceptual experience that we can understand anything we know, or judge anything as true. Perception thus is more important as a condition of knowledge and truth, than knowledge and truth are of perception.

All this implies a view of the world, which is another integral feature of Merleau-Ponty's philosophy. So far it might have seemed that the Subject has a great deal of power to create, or at least interpret, the world according to his own interests and purposes. There are limits to this though, set by the world itself. There is a way the world is. It has a history and in a sense an intentionality of its own. There is always an "already there" situation[15].

But to the extent that we can "know" the world and its situations at all, we can do so only in pre-reflective experience. When we speak about it, or describe it or reflect on our knowledge of it we lose something of it, and distance ourselves from it.

> "The world is not what I think, but what I live through." (Merleau-Ponty 1945/62:xvi-xvii)

As in Heidegger, the intersubjectivity of the world is, for Merleau-Ponty, "given", a fundamental fact of life, a ground or condition of the possibility of many other facts.

> "I would not even talk of solitude, and I could not even pronounce others as inaccessible if I had not the experience of others." (Merleau-Ponty quoted in Spiegelberg 1982:571)

But while it is true that what we perceive is largely a factor of the way the world is, it is also, and equally, true that "the world is what I perceive" (Merleau-Ponty 1945/62:xvi). This is certainly not a claim for the veridicality of perception in the traditional sense. Rather it is an expression of Merleau-Ponty's belief in the inter-definition and inter-dependence of the Subject and the world. Although the universe might exist in some sense independently of us, it is given to us in meaningful situations and we know it as our Life-world, because of the way we are, as well as the way the world is.

The way to learn about the world then is not to be told facts about it, nor to "study" it in as detached and objective a way as possible, but to experience it. And then, importantly, to interrogate that experience of the world, not simply to accept it as it at first appears.

> "Philosophy, [Merleau-Ponty] says, asks what the world is like before we begin to talk about it, and addresses that question to the 'mixture of the world and ourselves' which precedes all

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[15]This shows a contrast with Sartre's existentialism which emphasises human freedom, and the constant necessity for choice. In Merleau-Ponty's philosophy, human beings have only a *conditioned* freedom, conditioned by the intentionality of the world itself (in the widest sense of "world"). Also conditioned by the fact that much of our choice is made in a pre-reflective, sub-conscious way, and therefore not fully controllable. (Spiegelberg 1982:569, Passmore 1968:502)

> reflection. Then how, we naturally ask, can the philosopher *say* what he finds? Whatever he tells us will inevitably be a description of the world as it is talked about, not of the world before it is talked about. Merleau-Ponty falls back at this point on his description of the 'ambiguity' of language; through our language, he argues, we can suggest more than we can explicitly say. But of course what the 'more' is cannot be said." (Passmore 1968:503)

Truth and rationality are therefore conceived of very differently from the traditional view. The role of the philosopher is not to develop a systematic account of the world, and then teach it to others, correcting their confused picture of it. Rather it is to show the world in a different light, or lights, so that others will be led to question their everyday knowledge of it and thus deepen their own understanding.

The method of "interrogation" Merleau-Ponty recommends has several components. In one aspect it is a method of phenomenological reflection, in which we turn our attention to our own experience. In this, Husserl's reduction can be useful, though with an important qualification:

> "The most important lesson which the reduction teaches us is the impossibility of a complete reduction." (Merleau-Ponty 1945/62:xiv)

It can however be used to "slacken the intentional threads which attach us to the world, and thus bring them to our notice." (Merleau-Ponty Pref. p. xiii)

There is also an important place for empirical research and the knowledge of science. So Merleau-Ponty did not spend his whole life at pure philosophy, elaborating an abstract framework. He carried out investigations in many areas, and read widely in the human sciences, as mentioned above.

Unfortunately, he died very suddenly at a quite early age (53), and left incomplete work behind. It seems that he had returned to more purely philosophical considerations, and was reconsidering some fundamental aspects of his phenomenology at the time of his death, though it is difficult now to interpret exactly what was the direction his thought was taking. (I will mention this again below.) Now I would like to look at the implications of Merleau-Ponty's philosophy for an account of perception and language.

3.4.2. Perception in Merleau-Ponty's Philosophy

Perception was one of Merleau-Ponty's major areas of study, and a good deal has been said about it already. We have seen that he opposed classical accounts of perception based on representation, memory and matching, or sensation, rules and percept, in much the same way as Heidegger did: use of these terms assumes everything it purports to explain.

Merleau-Ponty certainly does not offer an alternative "theory" to explain the classical problems - for good theoretical reasons: the classical problems are not good formulations. Perception is the pre-reflective ground of all reflection, and therefore cannot be theorised about in a purely reflective mode.

> "Perception is not a science of the world, it is not even an act, a deliberate taking up of a

position; it is the background from which all acts stand out, and is presupposed by them" (Merleau-Ponty 1945/62:x-xi).

Perception takes place at a pre-conceptual level of consciousness, though this means something different from it would in cognitivism: the pre-conceptual is, in Merleau-Ponty's philosophy, deeply Subjective, and necessarily non-formal. Perception is about the relation of the Subject to the Life-world, and involves a pre-reflective structuring of the world according to its meaningfulness for the Subject. Far from being an act of intellect, organising sense-data and recognising objects on the basis of logical operations, perception is a "primitive patterning" into figure-ground structures, in which Objects stand out as meaningful in relation to the background. The way this happens - indeed *that* it happens - depends as much on the Subject's interests and motivations as on the characteristics of the Object:

> "Perception *structures* the perceived world; it is not so much the passive recording of sense-data as an expression of our perceptual intent" (Spurling 1977:26, his emphasis).

Meaning is thus at the centre of Merleau-Ponty's account of perception: Objects emerge for Subjects according to the situation and projects in which they are involved. So Objects do not have definite, essential once-and-for-all meanings. Merleau-Ponty's philosophy has been called a "philosophy of ambiguity", though it was not a term he liked (Spiegelberg 1982:544), apparently because of its pejorative connotation of equivocation. It also makes the meanings of the world seem already too definite and pre-determined. Things in Merleau-Ponty's philosophy are not so much ambiguous as enigmatic (Flew 1979:212).

> "Merleau-Ponty's philosophy is not one of twilight, but of chiaroscuro" (Spiegelberg 1982:544).

This is not of course, as has been seen, to say that the World cannot be spoken about at all. It does mean that no single perspective on it, no one vocabulary of terms, can describe it adequately. We must seek understanding from several angles simultaneously; many views can have something of truth to them, but they should not be isolated (Merleau-Ponty 1945/62), since to do so is to lose the truths of other perspectives. Much more will be made of this idea in the discussion of the rest of this thesis.

3.4.3. Language in Merleau-Ponty's Philosophy

Language also was a central concern of Merleau-Ponty's. His account of language and speech is characterised by the same impatience with traditional dichotomies, and concern to rise above them, as has been seen repeatedly above.

> "Language, according to Merleau-Ponty, is a perfect illustration of the dialectic relation between ourselves and our world." (Passmore 1968:502)

Behaviourist and intellectualist accounts, he argues, are alike in their drive to objectify, conceptualise and decompose language, and both rest on the assumption of various separations that Merleau-Ponty argues cannot be upheld. In each case, the point is not that no conceptual separation at all can be achieved; more that the separation is partial, and always grounded in a level where the "two" are one. It is not that at one level the two are separate while at another they are intertwined, though in a way still distinct. Rather at one level

there are not two elements at all, but an undifferentiated one. Crucially, the separation only works *because* a Subject has an understanding of the whole in which the two parts are *not* separate.

Firstly, it is impossible to divorce speech categorically from other human abilities and behaviours, or to see the linguistic system as abstract or self-existent. Speech and language are not just related to, but grounded in other human activity. Speech is thus more like an elaborated kind of gesture, than like a translation of thought into a logical code.

> "The movement from silence to speech is not the movement from nothing to something, from non-meaning to meaning." (Spurling 1977:51)

So speech is not separate from thought; it is neither a representation nor a sign of some thought that has been completed before being "put into words".

> "The greatest service done by expression is not to commit to writing ideas which might be lost ... but [to bring] the meaning into existence, it brings it to life in an organism of words." (Merleau-Ponty 1945/62:182)

> "...speech ... does not translate ready-made thought, but accomplishes it." (Merleau-Ponty 1945/62:178)

> "Expressive operations take place between thinking language and speaking thought, not, as we thoughtlessly say, between thought and language. It is not because they are parallel that we speak; it is because we speak that they are parallel." (Merleau-Ponty quoted in Spurling 1977:57)

Speech is grounded in the pre-predicative, pre-conscious operative intentionality described above, and *manifests* that intentionality (Spurling 1977:53). As has already been pointed out, operative intentionality is itself inextricable from human physical embodiment. Therefore, the psychological and physiological aspects of speech are not separable either (*cf* cognitive science's "functionalism").

> "It cannot be said of speech either that it is an 'operation of intelligence', or that it is a 'motor phenomenon': it is wholly motility and wholly intelligence." (Merleau-Ponty 1945/62:194)

Following all this, it is clear that a form/content distinction is impossible to uphold, for Merleau-Ponty. They cannot be seen as two elements held together or associated in an arbitrary relationship[16]. A word is precisely a *meaningful form.* A form without a meaning is not a word, nor is a content without a form. Philosophies which presuppose the separation of words into form and content - and cognitivist philosophy is only one of many of which this is true - are thus grounded in a distinction that cannot be upheld:

> "... we refute both intellectualism and empiricism by simply saying that *the word has a meaning.*" (Merleau-Ponty 1945/62:177, his emphasis)

> "To say that 'the word has a meaning' is to say that meaning is *embodied* in words and in speech, in the same way as it is embodied in behaviour and perception." (Spurling 1977:50, his emphasis)

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[16]De Saussure of course speaks often about the inseparability of signified and signifier. I will comment on the relationship between the two positions in Chapter 4.

Communication, then, far from being seen as message-transfer accomplished by code-transmission, is more like an evocation of empathy; and thus necessarily always partial. The linguistic meaning in the traditional sense of literal message-meaning, is not the only or even the most basic kind of meaning. It only works because it is based in other kinds of meanings and discourse. On the other hand, linguistic communication also helps to bring that more basic discourse more fully into being. Once again, the two cannot be strictly separated defined. Intersubjectivity and language support each other.

> "... communication between consciousnesses is not based on the common meaning of their respective experiences, for it is equally the basis of that meaning." (Merleau-Ponty 1945/62:185).

Having given so many negatives, how can Merleau-Ponty himself characterise speech and language? Merleau-Ponty distinguishes between **authentic** and **sedimented** speech: authentic speech is the articulation of new meanings, in which a Subject "gives voice" to an intention or meaning-for-himself. Once this has been accomplished, though, what has been said exists as a piece/part of language, to be used again, by that person or another. It has been *constituted*, and becomes *sedimented* in an *institutionalised* language. Authentic speech in Merleau-Ponty's sense is rather rare, characteristic of children, poets and lovers. All sedimented language, however, must once have been an instance of authentic speech. In order to understand sedimented language it is necessary to understand the way authentic speech is created: once more, they cannot be divorced from each other.

This has a bearing on Merleau-Ponty's understanding of the relationship of language and reality. Clearly, in neither authentic nor sedimented speech is there any sense in which language mirrors or reflects or represents reality-as-such. His view is rather close to that of Whorf (though Merleau-Ponty does not seem to have known Whorf's work): authentic speech gives voice to a meaning that emerges as part of the relationship between a Subject and a world. Sedimented speech incorporates a community's understanding of its world. Different languages and different communities have different views of "reality".

3.4.4. Discussion

Returning now to the train of discussion which has so far compared the philosophies of cognitivism, Husserl and Heidegger, the first thing to note is Merleau-Ponty's practical achievements. Though he takes Heidegger's philosophical perspective very seriously, he is hardly paralysed by its lack of foundations or its inability to provide an externally justified methodology. Merleau-Ponty manages to retain the richer view of the Subject attained by Heidegger's focus on existence rather than essence, without finding himself unable to utter a statement, or make coherent and persuasive arguments. It is important then to discover what enables him to make this kind of progress, despite the "subjectiveness" of his philosphical framework.

What he does not do, clearly, is create a system of basic categories, and a methodology,

and then set about constructing an edifice from that basis, as was the style of Brentano and Husserl. Rather, Merleau-Ponty's way forward is by breaking down categories that already exist - transcending them in a very fruitful, "constructive" way. He deliberately looks for ways in which, and conditions under which, categories or dichotomies fail to account for the reality they are imposed on, and thus deepens his understanding of the reality behind the categories. In this way he can use evidence and relevant information from a wide range of different areas, and can incorporate both empirical and conceptual arguments in his work.

The working of this method of procedure can be illustrated by showing one area where Merleau-Ponty himself does not follow it, but his analysis can perhaps be improved, with hindsight, by adopting his own policy of breaking down a dichotomy. My example is his treatment of "authentic" versus "sedimented" speech. Most modern linguists would now find fault with such a cut-and-dried dichotomy as Merleau-Ponty seems to make here. Use of "sedimented" language can be just as creative as "authentic" calling forth of a new word for a subjective experience or phenomenon. The use of the words "authentic" and "sedimented" seems to imply a value-judgment, or bias against "everyday" speech. Merleau-Ponty's focus on language as a set or system of words seems to obscure the creativity of language in use for him.

This is an instance where Merleau-Ponty has actually set up a dichotomy, which we are left, later, to transcend. It seems that he was later aware of the tension that this distinction caused in his work - that in fact it was part of a wider conflict in Merleau-Ponty's thinking between (Husserlian) phenomenology and structuralism that he was in the process of working out at the time of his death (Schmidt 1985, Edie 1976, Spiegelberg 1982). The opposition between the phenomenological and structuralist perspectives was one dichotomy that Merleau-Ponty was not well able to transcend in his lifetime - perhaps because the contrast between them was not so clear at that time, both being still in the process of self-definition. Merleau-Ponty perhaps deserves credit for not letting the dogma of one perspective blind him to the truths in the other - even though the result was a degree of inconsistency in some aspects of his work.

So - how should Merleau-Ponty's work be assessed in relation to the problems being discussed? The obvious question is whether his philosophical framework would do as an alternative approach to speech perception research to that of cognitive science. This framework has in fact been used as the basis of quite flourishing new disciplines of phenomenological psychology and sociology[17].

However, in my opinion, it is not the best possible formulation of the question in this instance. The problem with adopting Merleau-Ponty's philosophy as a framework for research is exactly the same as was raised with respect to Heidegger's: it would go

[17]Though little attention has been paid to the specific problems of speech perception. I will say more about phenomenological psychology in Chapter 5.

completely against the main principles of his philosophy if his own language were to become sedimented into a static structure of concepts. A better way of phrasing the question about Merleau-Ponty's work is to ask what its relevance is in a more general way; what do his insights mean for development of a framework of understanding speech perception?

One thing that emerges strongly from his work is the provisional nature of all dichotomies and categorisations - but also their importance in understanding. Understanding is increased by making categorisations and then transcending them, or breaking them down in fruitful ways. The particular set of categories that might be most useful or relevant in a particular domain is not decidable in the abstract, but depends on the topic, the purposes, the values, etc, of that particular domain.

Thus the World itself has no definite categories or essences - though it has a nature or way of being in a non-formal, non-categorial way. When we describe the World in language, using the categories and syntax of the language, we give something of ourselves and our point of view to make the description possible.

This view amounts to an antifoundationalism - in strong contrast to the foundationalism of Husserl who started the movement which led to this position - which has several extremely important implications for the nature of the Subject and the conduct of philosophical and scientific study of the Subject. Some of these relevant to the project of this thesis will be brought out in detail in Chapters 4 and 5.

Bringing out this aspect of Merleau-Ponty's philosophy is supported, I believe, by recent developments in continental philosophy, to which I will now turn, very briefly.

3.5. Deconstruction

Deconstruction can be seen as the latest stage in the phenomenological movement, although it is relevant to, and takes its impetus from, not only phenomenology but also structuralism and the classical tradition of philosophy.

Its major figure is Jacques Derrida (*eg* 1967/73, 1967/74, 1972/82). His central philosophical preoccupation is with the issue of philosophical foundations, in particular, the demonstration that there are none. This has certainly been a theme throughout the phenomenological tradition, as I have tried to point up in my exposition. A difference however is that Derrida focusses explicitly and pointedly on this issue, rather than attempting to elaborate a philosophical framework around it. He wants to demonstrate the full implications of the radical antifoundationalist position. The aim of much of his work is to uncover the foundational assumptions of various philosophical orientations, and then to undermine them - not to discredit the philosopher concerned, but to demonstrate the provisional and conditional nature of any foundations. He especially likes to show the reliance of an argument *against* a particular foundational dichotomy on the existence of the very dichotomy it is trying to refute.

His method is textual analysis. He works with a text to bring out the author's reliance, in making his point, on precisely the concepts, categories, or oppositions he is engaged in arguing against or overcoming. His usual way of doing this is by looking at the metaphors and other devices used by the author, in contrast to what is explicitly and literally stated.

> "We can think of deconstruction in terms of a 'double reading'; a double reading which reads the author's intended text, and reads also the text in a stricter sense. This double reading will illuminate where the text 'betrays' the author, where the text (and what it describes) will be shown to be at variance with the author's intention." (Durie 1987:5)

A good example is his deconstruction of Husserl's texts, to show the continuing reliance on a dichotomy between Subject and Object, in the very exposition of his view that the two are inseparable[18]. Or similarly, that his notion of self-evident *presence*, the fundamental demonstration of truth in Husserl's philosophy, incorporated necessarily a notion of *absence*.

> The 'now' cannot but retain traces of a past and future - indeed, they constitute the now, for it is only in terms of them that a now can be constituted as a source point, a source point for the spread of memory and expectation. The present is derived from its difference to the non-present, and so the present is determined by the absent." (Durie 1987:20)

And so it is with all "pure" concepts - they are always "tainted" in some way. In explaining this, Derrida introduces the word **différance**. It is extremely difficult to describe what this means, for reasons that will become obvious. It can perhaps be thought of as a "force" that underlies all classifications, conceptualisations, definitions, formalisations - and thus, obviously, all uses of language; a force that infects or taints every attempt to purify or idealise, and undermines every attempt to define a reliable universal foundation or framework

"Différance" incorporates a pun on two French words. One of its senses is that of "differing" or "being different from" and harks back to the structuralist dogma that words, etc, have meaning not in a positive way, referring only to themselves, but in a negative way, which requires reference to other related, *but not currently present*, words. Their meaning thus refers outside themselves: one source of "impurity". The other sense is that of "deferring" or "putting off till a later time". This takes account of the observation that the meaning of a piece of language (for example) is never *fulfilled*, 'closed' or fully realised, since later considerations can always expand or even alter the meaning. For example, we might accept someone's words as meaning one thing, then find out later they were lying, which radically alters the meaning, then find out later they were not lying but merely ignorant, shifting the meaning again, and so on. There is no one point at which we can be absolutely certain that all the relevant data is in.

These two aspects of différance both show the *pointing* of meaning outside or beyond itself; together they are responsible for the "remainder" or "surplus" that is always necessarily left over after any dichotomy or classification, which is the reason that there can never be any

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[18]We have seen the working out of this point in a different (not text-based) way, in comparing Heidegger's or Merleau-Ponty's view of human being with Husserl's.

universal, foundational classification, and that any attempt to provide one will always be deconstructible.

Such a philosophical perspective raises various philosophical and theoretical problems. Not least of these is the interpretation of Derrida's own texts. Naturally it is very important for him not to fall into the same kind of easy acceptance of sedimented classifications, etc, that make writing most deconstructible. In particular, it is crucial that his own coinage "différance" should not become frozen into a "concept" like any other. Derrida's aim is not to tell us about différance, but to show us it at work (or play). So his writing is full of convolutions, puns, allusions, clashing metaphors, changes of person and perspective, and other devices of a somewhat bewildering nature. He claims that he does not deliberately write in a way more unclear than necessary, though many would consider this disingenuous.

Given all this it is difficult at this stage to come to a clear understanding of the full implications of his work. Such questions as the degree to which his philosophy differs significantly from others' - *eg* the exact status of the term "différance" with respect to Heidegger's "Being", or the deconstructibility of Derrida's own texts - must await further development. In any event, this is not the place to try to come to any kind of conclusion about Derrida's opinions on these issues. The question here is only about the relevance of deconstruction, or antifoundationalism more generally, in relation to a philosophical framework for the study of human cognition. I will make some brief remarks on this relevance here; fuller discussion is the topic of Chapter 4.

Firstly, Derrida's work cautions us against taking over the perspective of any particular phenomenologist, expecting it to be reliably "right" in some universal sense. Of course Heidegger and Merleau-Ponty made this point to some extent themselves, in their insistence that the important thing is not to take over a set of concepts from a philosopher or anyone else who claims to have worked them out, but to come to a personal understanding of the pre-predicatively meaningful world, and then develop a vocabulary or system of description out of that understanding. The problem of justifying the choice of one philosopher, or one phase of one philosopher's work, or a selection of some aspects of various philosopher's works, would need to be solved before making a framework for research. For a simple example, every one of the philosophers we looked at underwent a major change of philosophical orientation in the middle years of his career. At which phase was he "right"? How should this be decided? The best way then to provide a framework for research on the topic of human cognition, is not to take it over from Merleau-Ponty, for example, whose topic, purposes and values were different, but to construct it ourselves, with criteria that seem relevant to our own topic, purposes and values.

Importantly, this point is relevant not just to philosophical systems, in the rather remote domain of abstract philosophy, but to *any* Objects, concepts and theories. Each of them is constituted within some philosophical framework, from some point of view or for some purpose - however vague or poorly articulated that framework might be - and is therefore a

correlate of that Subjective point of view. None of them can be objectively or universally valid; each categorisation leaves a "surplus" unaccounted for. However useful they may be within the perspective from which they were developed, transportation to another domain requires re-evaluation. No matter how familiar or obvious it is that some Object should have a particular essence, the Object gets that essence partly from a Subject; not wholly or purely from itself. That is one reason that phenomenologists like to make the familiar unfamiliar - to make exactly this point: that we must sometimes distrust and interrogate the familiar;rather than simply accepting as it seems to be in itself, we must sometimes try to see our own contribution in making it into what it is.

The thrust of the "antifoundationalism" that has been developed during the course of this chapter, then, is that there *really is*[19] no "foundation" to the World *in itself*. Though we make and use foundations constantly in our lives, these are foundations that *we* make and use, not foundations that we are compelled to acknowledge by the nature of the world itself. The justification of a perspective or framework can only ever be in terms of criteria that come down to values, beliefs and assumptions - not goodness of reflection of objective reality.

Derrida's "différance", I believe, can be seen as making precisely this point: the "différance" that underlies all categorisations, etc can be seen as the fact that a categorisation depends always on both the "reality" being categorised, and the Subject doing that categorising. Both of these are complex, and not explicitly definable, and their interaction has the effects described by Derrida as those of "différance".

These points and their implications will be discussed and clarified in detail in the following chapter. As a footnote to this chapter, I would like to make some comparisons between the philosophies discussed here, and one which is more familiar to cognitive science.

3.6. A Note on Wittgenstein

I have refrained so far from making any explicit comment on the relationship between Wittgenstein's philosophy and those of the phenomenologists, although the question will certainly have arisen in the reader's mind. The reason is that while there is clearly a strong similarity of concern, it's not entirely obvious how he fits in, or which of the phenomenologists he should best be compared with: it depends on how you interpret Wittgenstein, whose epigrammatic style and concern with question-raising rather than question-answering make him notoriously open to multiple readings (not to mention the fact that he too underwent a major change in philosophical orientation in the middle of his career). His work has, in fact, been likened with some plausibility to that of each of the philosophers discussed in this chapter (see for example, van Peursen 1959, Staten 1985, Spurling 1977, Llewelyn 1985, 1986).

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[19]Compare cognitivist antifoundationalism. Some cognitivists acknowledge the role of a Subjective viewpoint in determining which of several possible foundations might be relevant in a given context; but not the necessary role of some Subject in making a Thing into any Object at all.

Fortunately, however, it is not necessary to the argument of this thesis that a definitive statement be made on the question. The point here is not what differentiates these philosophers from one another, but what unites them (and others) against the kind of philosophy on which the IP approach to speech perception is based. This is part of a larger dichotomy in philosophy between what might be called "formalisers" and "non-formalisers"[20], discussed very interestingly for example by Rorty (1976, 1980), Taylor (1985) and others.

In terms of such a broad division as this, I think the later Wittgenstein can unhesitatingly be classed along with Heidegger, Merleau-Ponty and Derrida[21]. He too strives to undermine familiar dichotomies such as those between language and thought, sound and meaning, mental and behavioural. He continually points up the inadequacy - despite the familiar appearances given in everyday experience - of the view that words and sentences have definite or fixed meanings; or the idea that there is some "inner man" or private language of thought of which public speech is a more or less accurate translation or reflection In fact this kind of questioning of the familiar is one of the main preoccupations of his philosophy: he wants to encourage us to doubt our everyday assumptions; to show us differences where we usually see similarities[22].

To Wittgenstein, definitions, descriptions, explanations and so on are forms of language used in contexts, which work because they let us feel we 'know how to go on'[23], not because there is some objective sense in which they reflect, accurately or otherwise, pre-existing categories. The "sameness" presupposed by any categorisation is, Wittgenstein says, more like a 'family resemblance' than an identity. So there is a sense in which any use of language is a metaphorical use, since it compares things which are not strictly identical.

Thus language and communication, though describable in terms of rules, cannot *consist in* rule-bound systems or behaviour. Any of the rules we define could be overridden in the light of later information (*cf* Derrida's 'deferral' mentioned above); any use of rules implies an understanding of the criteria and conditions of their application, which cannot be exhaustively accounted for in terms of rules - no rule can cover all risks and all eventualities.

All this fits in well, I believe, with the inversion of *actual* and *ideal* as the domain of greater value that has been seen during the course of this chapter. For Wittgenstein, as for Heidegger and Merleau-Ponty, ideal or formal descriptions are seen as abstract, provisional

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[20]Or betweem those who believe in the importance of "edifying" as opposed to "systematising" philosophy (Rorty, 1980). Compare Wittgenstein's view of philosophy as "therapy".

[21]While the earlier Wittgenstein, of the *Tractatus*, would appear to have strong similarities with Husserl, which makes the comparison between Heidegger's arguments against Husserl with Wittgenstein's against his own earlier self an interesting topic.

[22]In this he is different from much of 'systematising' philosophy, which aims to show similarities where we are used to seeing differences (McGuinness, 4/5/89).

[23]Interestingly, Wittgenstein does not seem to dwell much on the unreliability of this most unreliable of feelings, though he is so concerned that we should in general not accept such appearances at face value.

and partial. The actual is not derived from the ideal, a deformation of it. Rather the ideal is derived from the actual. To forget this, says Wittgenstein, is like thinking that smooth ice, which offers no friction and is thus in a sense ideal, is better for walking than rough ground.

3.7. Conclusion

How then should the relevance of the work described in this chapter be assessed in relation to the enterprise of cognitive science? It is easy to see the phenomenologists as either too different in their concerns and style to have much to say to cognitivism, or as too similar, so that their work can be assimilated to the terms and problematic of cognitivism[24]. Neither of these reactions is, in my opinion, adequate. Non-formalist philosophies are significantly different from cognitivism, in ways that have major implications for the enterprise of studying human perceptual and cognitive abilities.

Of course, as has been seen, cognitivist philosophy acknowledges the antifoundationalist position up to a point, but, I argue, does not follow its implications. I can give one brief example at this stage, though it is the following chapter that is mainly concerned with setting out the implications of antifoundationalism, and assessing cognitivist philosophy according to how it fulfils them. Cognitive science accepts antifoundationalism to the extent that it says (as was seen in Chapter 2): since it is not possible for a framework to be "right" in the sense of reflecting accurately the true nature of the world, it is permissible to define a framework to use as a "working hypothesis". Whatever is learned from research within such a framework might not be "right" in any strong sense, but it will increase knowledge and perhaps be fruitful enough to lead to a redefining of key questions. Merleau-Ponty's method, described above, is very different. He says that no one view can give a complete picture, and so it is necessary precisely *not* to stick with one perspective, but to vary the perspectives from which the world is viewed if we are to increase our knowledge or understanding.

However, I have left the most important implication of antifoundationalism until the last. That in my opinion is what it says about the nature of the Subject who inhabits the antifoundationalist World I have described. If the World does not come prepackaged as Objects with clearly defined essences, the Subject must be of a kind which can constitute and define Objects out of the inchoate experience of the Life-world.

The following chapter will tie these remarks together with those from Chapter 2, and explore some of the ramifications of the position I have outlined here.

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[24]Winograd and Flores (1986) and Bateman (1983) are examples of attempts to fuse the phenomenological and cognitivist enterprises; Flanagan's (1984) seems to simply equate the phenomenologists' arguments with those of a popular branch of cognitivism, that which deals with concepts like "frame" "script" or "schema" (see his note 24, p.296).

Chapter 4

SUBJECT AND WORLD

4.1. Introduction

In Chapter 2, I set out the central tenets and philosophical framework of cognitivism, the background philosophy within which the information-processing approach to human speech perception research is situated, and called attention to certain respects in which it could be considered to have an inappropriate understanding of the nature of the Subject of speech perception.

These observations motivated a turn to continental phenomenological philosophy, noted for its interest in Subjects and Subjectivity, and Chapter 3 provided a very brief account of phenomenology in some summary phases of its historical development. There did emerge, by the end of the chapter, a conception of the Subject that is quite different from cognitivist philosophy's, and more satisfactory in relation to some of the points raised against cognitivist philosophy. However, it was found to be impossible to counter cognitive science's problems simply by incorporating this new Subject into its existing framework. Too much is related to the Subject: if it is changed, much else will be thrown out of balance. In particular, it was found that the very elaborated phenomenological Subject was correlated with a very anti-foundationalist general philosophy. Taking over that view as well, in cognitivist philosophy, would be impossible, not only because it would have very unsettling repercussions for the enterprise as a whole; but also because one of the concomitants of taking a view of reality and philosophy such as that of Heidegger, Merleau-Ponty or Derrida is that terms, concepts and explanations cannot be transported as sedimented units to another domain. Taking over all or part of such a philosophical framework readymade would thus run exactly counter to its own intention. Instead, I believe, it is necessary to acquire an understanding of the insights of the phenomenological movement in such a way as to be able to apply them where relevant to a particular domain.

It is the task of this present chapter to come to grips with the issues raised, and their implications for a framework for speech perception. The first sections draw together the

main insights of phenomenology, as set out in Chapter 3, relevant to the topic of this thesis, focussing and developing the discussion started there as to its significance for the cognitivist framework outlined in Chapter 2. It need hardly be said that the view put forward, though in part derived from and inspired by phenomenological philosophy[1] is very much directed by the needs of the project at hand, and by no means makes claims of being a comprehensive representation of the work of those philosophers.

The later part of the chapter turns attention back to cognitivist philosophy and assesses its appropriacy as a background philosophical framework for speech perception research, viewing it from the perspective developed in the first part. Though I believe my arguments have relevance to cognitivist philosophy as a whole, I do not develop all the points that would be needed for a full-scale critique, but focus on cognitivist philosophy in its role as a framework for understanding speech perception.

Finally, I point out what I consider to be a fruitful direction to explore in developing an alternative framework for speech perception research. Outlining what such a framework could be is the task of Chapter 5.

4.2. Subject and World

4.2.1. Antifoundationalism

In this section, I would like to review one of the main themes of Chapter 3, and distil the parts that are most relevant to the concerns of this thesis.

A major trend of the argument of Chapter 3 was towards the view I call **antifoundationalism**. This view makes very strongly the point that there is no neutral or objective description of the World or the things that comprise it which can be used as a universal or objective foundation on which to build theories. It was stressed that this is not to claim that the World does not exist independently of anyone's description of it, or that it exists only in the mind of its observer[2]. There is no reason to doubt the existence of material things; the claim of antifoundationalism is that their existence *as what they are* depends on the participation of a Subject for whom they are what they are, Objects with a particular nature, essence or description[3]. Part of what makes an Object what it is is the perspective of the Subject for whom it is an Object.

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[1]In fact, as has already been noted, the phenomenologists are not the only philosophers to make arguments of this kind; their arguments can be seen as part of a larger philosophical debate between "formalists" and "non-formalists".

[2]It is thus necessary to make a "distinction between the claim that the world is out there and the claim that the truth is out there" (Rorty 1986:3). It is only the second claim that is being opposed here.

[3]I will continue to capitalise the words "Subject, Object, World" when I mean them in the special senses developed here. I will also add some new terms in the course of the discussion and capitalise those as well.

This view of the relationship between Subject and Object has many important implications, not all of which are straightforwardly evident or easy to follow. For example it was seen in Chapter 3 how Husserl, who makes a clear explicit statement of the interdependence of the two the basis of his philosophy, nevertheless develops a philosophical system which is in crucial ways very "foundational". Nearer to home, it is not uncommon to hear a philosophical view propounded which sounds very much like the antifoundationalism I am stating here. In particular, as was seen in Chapter 2, cognitivist philosophy makes various statements which on the surface are quite similar (*eg* that "truth" is relative to a framework of pretheoretical assumptions which must be justified in terms other than those of the theory they support). This is an important insight. However, I believe the implications of antifoundationalism run much deeper than cognitivism allows. In fact, I will argue below that, if followed correctly, they undermine the coherence and validity of (some parts of) the cognitivist enterprise - IP models of speech perception being the focus of my discussion.

These implications will be easier to draw out using some vocabulary, already introduced in Chapter 3, which I will rehearse here. The first distinction is between the World (as it exists in itself) and the Life-world (the World as it exists for human Subjects who inhabit it). Of course we can only ever know the latter, though several kinds of scientific endeavour are directed towards discovery of the former, to the extent that this is possible. In this thesis, I am interested only in the Life-world, and do not observe the distinction as clearly as would be necessary in some other domains. Of course, it is the focus on the Life-world that leads phenomenologists like Merleau-Ponty to give such high value to *experience*, as opposed to *knowledge*. The second distinction, most important for present purposes, is that between Thing[4] and Object, where the Thing is something that has being for a Subject, has emerged as a significant feature of the Life-world, but has no *essence*, no *existence-as*. The Object is the Thing as described - given an essence - by a Subject in a domain. This concept of Thing is difficult to grasp, but even more difficult to use. It is sometimes necessary to speak about some Thing, but of course, it follows from the distinction I have drawn between existence and existence-as that an entity, characteristic or feature cannot be verbally pointed at or mentioned without using some descriptive term, and thus making an Object of the Thing. It is therefore necessary, in speaking of a Thing, to talk *around* it, and to beware that use of a descriptive term for it in this context does not bind one to the connotations and implications it might have in another context, even if that other context might be seen as in some sense the proprietary context of the term. This kind of tactic goes very much against the grain of familiar principles of rational thought, which insist upon strict definition and consistency of use of defined terms. These principles are of course indispensable in certain kinds of

[4]It will be clear almost immediately that the word "Thing" here is highly dangerous - though the use of some term for what it means is imperative. To say "Thing" suggests a noun-y, self-existent kind of entity, but "Thing" as meant here should have no such connotations - just as Object should have none. McDonald (1988:248) has faced a similar problem: "The problems of language here are evident in my use of the word 'thing'. Literally, I risk reification. I am, however, comforted by my dictionary which gives as its first definitions of 'thing', an assembly, parliament, court, council." Also, as discussed at the end of the last chapter, Derrida is well-known for the devices by which he attempts to work round this difficulty in the use of a word for his "différance".

thinking, where it is possible to remain on the level of already-constituted Objects. They are not always appropriate in domains where it is necessary to involve pre-Objectified Things. In fact I suggest it is partly a difficulty in keeping distinct Thing and Object that lies behind the patent misunderstanding of some phenomenologist thought by some cognitivist thinkers (Pylyshyn 1981, Searle 1977 can be singled out as examples). I will point out frequently in the discussion that follows places where these distinctions are most relevant. The term "Object" has been discussed already at greater length: it is the word used for any *described Thing*.

One of the most significant implications of antifoundationalism as far as this thesis is concerned has to do with the nature of the Subject that a philosophy can postulate reasonably, given its other commitments. The interdependence of Subject and Object means that any description of the World, as in a philosophical system, rests upon (perhaps implicit) assumptions about the Subject; and similarly an understanding of the nature of Subjectivity is closely connected to a (perhaps implicit) understanding of the nature of the World. These sets of assumptions should be coherent.

Before continuing, I should mention very briefly an implication that antifoundationalism does not have (this point will be discussed in more detail below). It does not mean that there can be or should be no foundations *at all*. If that were the case, nothing could ever be said, let alone be said to be true, or right. Antifoundationalism simply implicates in any foundation the connivance of a Subject in making it a foundation; and thus makes any foundation a *local* rather than a universal one. I criticise cognitivist philosophy not for postulating a local foundation for its project, nor for failing to acknowledge that it is only a local and not a universal foundation, but for failing to realise the implications of the fact that their foundation is local - implications both for the nature of the Subject and for the conduct of their own enquiry. I will spell this criticism out in detail in the course of the present chapter.

Next, I would like to start by discussing some of the general implications I consider antifoundationalism has for the nature of the Subject and the World to be postulated by a philosophy.

4.2.2. The Nature of the Subject

If antifoundationalism means that there can be no neutral or universal descriptions of the Things in the World, it would certainly be highly contradictory for me now to state an objective definition of "The Subject". However, I think I can point to some characteristics of Subjects that would appear to be implied, and, conversely, ruled out, by the position I am adopting.

Firstly, it is necessary to account for how Objects of the world can arise at all. As we have seen, the phenomenological position is that Objects are constituted from Things which emerge as meaningful entities in the Life-world for the Subject from a background or horizon

of meaning. The Subject must therefore be a being for whom or for which this can happen, that is, one for whom/which features of the world stand out as significant or meaningful. In the case of human Subjects this happens naturally because we are alive: things take on significance according to how they affect our survival, comfort or well-being, and our purposes in achieving or maintaining these. Our being alive, experiencing, is for us the ground of meaningfulness.

Just being alive however is not enough to give us full Subjectivity in the required sense. We also have another characteristic: the ability of self-reflection[5]. Human Subjects are *self-reflective* beings, who can take themselves and their actions as Objects of contemplation. So we not only react to those aspects of the world that are relevant to our needs and interests in our lives. We can also be aware of the reactions themselves. Thus for example, instead of simply reacting in a way an observer might say was analogous to two different events, we can ourselves observe the analogy, and abstract the characteristics of similarity. (Interestingly, we seem to ascribe differences in Objects more to differences in the World than to differences in our Subjective viewpoint.)

In this way, we can make classifications, and abstract the features that make for similarities and differences. The features abstracted can be reified, named and themselves classified, and so on, resulting in Objects of many different kinds of ontological status. A crucial point here, which will be returned to below, is that such a self-reflective description is, like any other description, a Subject's interpretation, not a neutral or objective representation. (Recall here the progression from Husserl to Heidegger to Merleau-Ponty on the question of "self-evidence" or "presence to consciousness". A necessary characteristic of the Subject in Heidegger's philosophy was the "splitting" of the self into more than one kind of consciousness, not identical or transparent to each other. One part of the Subject can be Observer to the other(s).

Perhaps it would prevent misunderstanding if I were to point out briefly a claim my position emphatically does *not* bind me to. This is an example of the need to talk about aspects of the World, Things, without making them into Objects of a theory. I say here that the human Subject's existence as a living entity is the ground of meaningfulness for us: this is by no means equivalent to the claim that a *biological description* of a human being is in some way basic, neutral or foundational.

To return to the analysis of Subjectivity, the characteristics mentioned so far are presumably closely intertwined with a third essential aspect of human Subjectivity - which is not really a single characteristic, but a whole conglomerate of closely interlinked and interdependent factors, none of which could be fully developed without the others: our development of

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[5]This observation is made in many different ways by many different people: human beings are described as self-interpreting, self-describing, self-modelling, etc. The difference between these views is in the details of how this characteristic of human beings is understood (see Taylor 1985, ch.4).

cultures and language; our intersubjective nature and our life with others in communities. It is these that allow, and are allowed by, "sedimentation" - an apparent stability of existence-as that would not be possible otherwise[6].

All this is related to our ability to imagine, hypothesise, etc, so important to our reasoning powers. It also means that we can see ourselves as others see us[7] compare ourselves to others, or measure ourselves against imagined ideals, giving us pride, shame, identity, etc, etc. So possession of an individual personality is closely bound up with Subjectivity: individual differences are given extra dimensions, and greatly complicated, by our self-descriptions. The way we describe ourselves influences what we do, and how we understand the world (Taylor 1985). So our purposes and projects are not related only to our survival and physical well-being, but become intervolved with various "psychological" purposes and needs. Thus the Subject is a "self", a being which can mean "I, me, us".

Our Subjectivity thus can be seen as giving us what amounts to a set of ingrained "biases" or "prejudices" according to which we see the world - to do with our living nature, our cultural and linguistic heritage, and our purposes or goals on particular occasions. "Bias" of this sort is absolutely ineliminable. Using the word "bias" suggests that there is an unbiassed perspective, but that is not the case: eliminating one bias merely substitutes another. Mundanity, neutrality, and other ascriptions of ordinariness are not lack of bias in this sense, but rather, a bias of a different kind, perhaps one more shared with others of our community. Rather than use the words "bias, prejudice", I prefer to say that we bring **values** to our view of the World.

> "Nor is it ... the essence of the mind to look at things impartially. When we look at the world ... we are always 'in a certain mood'. Men talk of overcoming their moods, but what really happens in such cases ... is that one mood overcomes another. Even apathy is a mood, not the absence of a mood." (Passmore 1968:480, explaining Heidegger's view)

All these characteristics and more are involved in giving the Subject what I call a **point of view**, which is *necessarily* far from "neutral". It is *necessarily* informed with desires, fears, purposes, needs, values, prejudices, anticipations, interests, and so on. A Subject's point of view changes constantly, sometimes very rapidly, and usually overlappingly - *ie* one discrete "state" does not give way at a certain time to another discrete "state".

So, according to the view I am developing here, the human Subject is a living being, a

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[6]In this thesis I concentrate mainly on the nature of the individual Subject, rather than on the social context within which any Subject must be situated to achieve full Subjectivity. This by no means implies that I consider the individual "more important" than the society. The relationship between these two is very much one of co-constitution - neither would be what it is without the other. To speak of one or the other is to make exactly the kind of abstraction from a whole as is the focus of much of the discussion in this chapter. However it is a case where I believe the focus on one or the other for the purposes of research can be justified - so long as it is not done to the exclusion of consideration at all of the other.

[7]No particular *accuracy* is being claimed for this ability. It does not have to be accurate to have the effect it has (though of course complete inaccuracy is not the norm either, being associated with madness). This has again to do with the distinction between an understanding of the pre-reflective Life-world, and any *expression* of that understanding.

member of a culture, with an individual personality, engaged in projects and enterprises with multifarious motives and purposes, who interprets and describes the world, including himself, as it appears to him to be. What I am claiming, in keeping with Heidegger and Merleau-Ponty, is that these characteristics - *ie* the having of a point of view in the sense meant here - are essential factors in perception and cognition. Without these, objectification, significance and meaning could not arise in the world. Things would exist, but not *as* anything; not even as individual "things". A Subject which lacked the qualities I have mentioned, or something like them, would not be a Subject which could make sense of the world.

There is a way of reading this which makes everything I have said here rather uncontroversial, perhaps even obvious. Cognitivist philosophy for example, is also based on the understanding of cognition as crucially involving knowledge, desires, goals, etc (as set out in Chapter 2). One difference lies in the extent to which cognitivism accepts the existence of *particular* beliefs, desires, etc, *as* described, in (or rather, "represented in") the mechanism of cognition. The view I set out here says that any such description, even self-description, is a Subjective *interpretation* or *articulation* of a pre-conscious, pre-conceptual, pre-reflective, pre-ontological, non-explicit experience of the Life-world, and thus cannot fully encompass what it describes. I will discuss in detail below this and other ways in which cognitivism fails to honour the implications of the antifoundationalist Subject, even when it claims to accept them.

4.2.3. The Nature of the World

All this concentration on the Subjective should not be allowed to blind us to the contribution made by "reality" itself to the existence of Objects. It is certainly true that the world does not come "prepackaged and labelled", but that is not the end of what can be said about it. It does not mean that there is no "way things are". Phenomenology for all its Subjectivity, is not idealism: the notion of the "given" is an important, though problematic, one in all versions of phenomenology. There are several kinds of things that can be said about the world that are relevant in the present context.

For example, the image presented above of a lone Subject interpreting a vast and formless reality was a "limit" image, evoked for the sake of argument, to show the necessity, in the limit, that for there to be "Objects", there must be at least a Subject to interpret reality from a point of view. The world as we encounter it in our lives includes of course, and has included for a long time, many Subjects for whom it has been meaningful. It has a structure and a "way of being" (though not a fully articulated one). Attempting to "explain" the Life-world without taking this into account would be an error. In particular, many of the Objects that we encounter are presented to us *as what they are* through a filter of our language and culture, rather than being constituted anew by each Subject on the basis of individual experience. Another misleading image that may have arisen is that of a single Subject confronting an

isolated Object from across a chasm in some primal act of interpretation. Again this is a limit. In the normal course of our lives, we come across Objects in the course of using them, *ie* in a context, which also contributes to our interpretation of what the Object is.

To say we cannot be objectively "right" is not to say we cannot be wrong. We cannot have a *neutral* perspective on reality; or say anything that is "objectively true" about it, but we can certainly have better or worse descriptions, given our values, purposes and background assumptions.

> "For in so far as we can talk about illusion, it is because we have identified illusions, and done so solely in the light of some perception which at the same time gave assurance of its own truth." (Merleau-Ponty 1945/1962:xiv)

After all, this thesis is largely devoted to criticising a certain description of reality as inappropriate or misleading given certain values and purposes; and I have just made several statements about the nature of Subjectivity, which I argue to be "true" - or valid in the context of what is to be accomplished.

The crucial point is that in saying anything about the World, we are putting our understanding into language, therefore making making explicit and giving essence to that which *in itself* is not explicitly categorised. This is the reason behind the effect expressed by Merleau-Ponty's "chiaroscuro" and Derrida's "surplus" (recall Chapter 3); or, in plainer language, the fact that the whole is more than the sum of its parts: there is always another way of looking at it which would make it different, and would include some aspects that the first has had to leave out.

> "I am open to the world, I have no doubt that I am in communication with it, but I do not possess it; it is inexhaustible." (Merleau-Ponty 1945/62:xvii)

No one description can give us an understanding of the reality described; understanding requires varying the point of view, exploring the limitations of categories of description[8].

A particular aspect of this point is that it should not be expected of the World *in itself* that it should be "consistent" in the sense that it should, of itself, fall into a single, logically related system of classifications. Consistency in that sense depends on a Subject's contribution as well as "reality's". Such ideal systems are therefore tied to the context in which they are developed. Ordering the world into a regular consistent system - valuable as it is to do this - is something that we want to do, for the sake of our understanding, not something we are compelled to for the sake of reflecting reality more accurately. In particular, given the description above of the Subject's activity of reflecting on and comparing the Objects that arise as meaningful for it, abstracting features and characteristics, reifying, classifying and idealising, and so on, it follows that any regular, formal, ideal abstract system is the result of some operation by a Subject with a point of view.

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[8]This is the reason behind the point made above that it is sometimes necessary to argue for the existence of some entity or feature of the World, without being committed to all the ramifications of its existence *as* a *particular* description. The word "is" cannot now be taken as indicating an enduring and objective essence. At most it gives a provisional interpretation, rather than a universal definition.

A most important ramification of this understanding of the nature of the world in the present context has to do with how a *formal* description should be viewed. The giving of a formal description can be seen as a special kind of essence-ascription. As such it is a product of a point of view and an aspect of the world in a context or situation. The formalisation *depends upon* the point of view and the situation. It is thus derivative, not basic. There is much that is "left out" in any formal description, which cannot be reconstituted from the formal description itself[9]. This is one of the major reasons against the symbol-manipulation view of human cognition, as I started to argue at the end of Chapter 2[10]. A formal system can exist only *for* a Subject; never *as* a Subject.

4.2.4. The Role of Language

In the picture I painted above, language is an integral part of Subjectivity, a part of what we are as human beings, and closely bound up with our other most fundamental human characteristics. Clearly, then, it is impossible to define, any more than it would be possible to give a sensible definition of what a human being is, and expect it to last beyond the immediate context of the epigram.

However, our use of language has various effects that can be mentioned in the present context. Perhaps one of the most interesting features of language is the way it is ambivalent between being part of the Subject and part of the World. "The language" a person speaks (however defined) must exist in some sense separate from any particular individual user of the language. And yet for each individual it must be individually "theirs".

It is through language that we can *articulate* our understanding and thus (partly) bring into being our world as it is for us. As was seen in the discussion of language in the philosophies of Merleau-Ponty and Heidegger, the ability to name aspects of our experience is considered the "authentic" use of language. To give such an experience a name is to give it its being as an Object.

> "It is the office of language to cause essences to exist in a state of separation which is in fact merely apparent, since through language they still rest upon the ante-predicative life of consciousness." (Merleau-Ponty 1949.62:xv)

Even in this brief description however, I have already swung too far towards a very individualistic pole of language-description. Not every use of language is an originary calling forth of a new linguistic entity. Language is also social as well as individual, and there is a sense in which it exists (perhaps, seems to exist) *as a separate system* for its users. In its

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[9]This fact is significant not so much because of the aspects of reality that are left out in making a formalisation (they are presumably deemed for the time being relatively unimportant anyway); as for the *fact* that *anything* has been left out; for the fact that a decision has been made as to what to leave out and what to consider essential. This kind of decision, when phrased in this way, obviously implies a Subjective point of view from which these judgments are made.

[10]See Dreyfus (1972/79) and Bateman (1983) who make very similar points with particular reference to cognitivist philosophy.

existence, it can guide and shape our understanding and apprehension of the world: if two things are given the same name, they will seem the same; if something is named by a noun, it will seem like a thing; if by a verb, like an event, and so on. This is the point made by the much-misunderstood[11] linguist, Whorf. There are limits to what an individual can do, set by the existing structure of a language[12].

> "The speaking agent is ... enmeshed in two kinds of larger order which he can never fully oversee, and can only punctually and marginally refashion. For he is only a speaking agent at all as part of a language community,... and the meanings and illocutionary forces activated in any speech act are only what they are against the background of a whole language and way of life." (Taylor 1985:11)

Again though it is necessary to pull up before going too far in the direction of language-as-a-system at the expense of language-as-individual-action. I have noted already the dangers of drawing too rigid a distinction between "authentic" and "sedimented" speech. However sedimented a piece of language, its use always involves a judgment made from a Subjective point of view (perhaps a judgment made in a pre-reflective way) whether to apply that term in a particular instance. That judgment certainly depends on the Thing given in the real world. But it also depends on the context in which it occurs and on the Subject's point of view - which do not endure unchanging. If there is a change in any of the three, the classification of the "reality" can change. Less obviously, if there is stability in any of the three, the classification can stay the same. Which one of these will be focussed on is not externally specifiable. The attitude of the Subject is part of the meaning of words and sentences, though we rarely notice the contribution of our own Subjectivity.

It follows from all that has been said so far that we cannot rely on language to give a perspicuous representation of reality. Language can make it seem that things have enduring essences in and of themselves, by pointing our attention away from ourselves, and towards the Objects that we speak of. But language use is not an automatic[13] association of a symbol with an Object, or a representation with a represented. Similarly, describing a situation with a sentence is not an automatic or formal procedure, but involves interpretation and judgment by a Subject, as well as the relevant arrangement of reality and the context in which it occurs. The fact that as members of a community we often reinforce each others' judgments tends to hide the fact of the judgment itself from our view: if everyone agrees on a description, we feel it is simply reading off a label, rather than constituting an Object.

Neither, on the other hand does language necessarily distort or obscure reality, since it is partly implicated in creating that reality, by allowing us to articulate our understanding of our world. There is no sense in claiming that ordinary language is in some general way

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[11]Though understandably so, given the way he expressed his ideas.

[12]The English pronoun system provides a good example: new words can be coined apparently indefinitely for new technologies, social phenomena, etc, but a good way of expressing the simple concept "he or she" has not yet emerged.

[13]It might be "automatic" in the sense that it is not deliberated over; it is not in the sense of being "algorithmic".

incoherent - though of course particular uses of a particular language can certainly be criticised as incoherent or misleading. Nor is it sensible to try to replace an entire language with another in the hope of providing a more accurate representation of reality. No single linguistic description can show us reality - though with careful use of many descriptions from different perspectives, surely we can, as Merleau-Ponty believed, achieve increased understanding of our world and ourselves.

Language is our tool for understanding and communicating, but it has limits which must be taken into consideration in interpreting what it shows us. One of its uses, as has been seen, is precisely to help create the "local foundations" that are part of the basis of our community lives. In communicating we are not transferring a representation of a meaning that will be decoded by a hearer; we are articulating an understanding that will be interpreted by the hearer.

4.3. Implications

4.3.1. General Implications

Taken together, these observations make the antifoundationalism I am advocating a **radical antifoundationalism**: there really are no objective or foundational facts, essences or definitions. Not just the Objects, but also the criteria according to which judgments are made, explanations are accepted, relationships and categorisations observed, methods deemed reliable, and so on, are necessarily and profoundly Subjective[14], in the sense that they rest on a view of the world as seen from Subjective perspective. (Consider how often the truths of science or philosophy rest on Subject-concealing words like "obvious", "possible", "indubitable", "obscure", "apodictic", "strange", "familiar" or, importantly in the present context, "abstract", "ideal".) These criteria include tacit or implicit biases and values as to analogies, directions of appeal for authority, etc. Though aspects of these criteria can sometimes be made explicit in an act of reflection, of course this can never be wholly or objectively achieved, or universally justified. All this can be summed up by simply saying that the philosophical or scientific researcher, the Observer, is a Subject in the full sense of the word as it has been developed here.

This radical antifoundationalism is, I believe closely related to Derrida's *différance*, the "force" he sees as underlying and undermining all dichotomies; though I prefer, in the context of the present project, to think of it in terms of this relationship between a Subject and a World, both of which are complex and changeable. This relationship accounts for all the effects of "différance", but lessens the problems associated with the use of a *word* which can give the impression that it names an entity.

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[14]This is not of course the same as being "subjective" in the (often pejorative) everyday sense of "idiosyncratic" or even "unfair".

This view has major implications with respect to some common ways of thinking. The general point is that it necessitates a more rigorous distinction between *existence* and *existence-as*, and implicates in *any* existence-as - description, interpretation, classification, etc - the point of view of a Subject. Any philosophical view which rests on the notion of "the given" is thus faced with the problem of justifying the *description* of the given (Spiegelberg 1982:115, 116). Any philosophical or scientific enterprise which starts by imposing a definite ontological system is faced with the need to justify the Subjective values the system depends on in terms of the domain to which it is applied. Any use of the notion of *representation* must be prepared to account for the constitution of the Objects being represented (Judge 1985).

The next sections draw out some specific implications of radical antifoundationalism for philosophical and scientific enquiry.

4.3.2. Implications for Philosophical Enquiry

One way of phrasing the argument so far would be to say that an attempt to work out a "first philosophy" in the old-fashioned sense of the term is futile. There is no universal ontology and epistemology which can be worked out in abstract terms and then used as a guide to reliability in other areas of philosophy and science. Questing after "truth" in the sense of an accurate or perspicuous reflection of reality is pointless.

> "Philosophy does not hold the world supine at its feet. It is not a 'higher point of view' from which one embraces all local perspectives." (Merleau-Ponty, quoted in Schmidt 1985:37)

Taking this position opens up various extremely interesting lines of philosophical enquiry that follow on from the discussion of Chapter 3. Some of these are topics of current research in philosophy.

One kind of question is whether there might be a kind of "first philosophy" in a more modern sense: the position from which it is possible to say there is no first philosophy in the old-fashioned sense[15]; a position for example which emphasises the Subjectivity of our view of the world and reminds us that every distinction depends on not only the nature of reality, but also the vague but complex conglomerate of attitudes brought to it by the Subject. Or is there indeed some kind of limit on our ability to understand ourselves in our own terms - something analogous, in the case of non-formal beings, to the limit that Gödel proved with respect to formal systems. If there is such a limit, could we "prove" it in that sense? Or would the proof itself constitute a "place to stand" and thus involve a Subjective point of view?

> "If one of the fundamental uses of language is to articulate or make manifest the background of distinctions of worth we define ourselves by, how should we understand *what* is being manifested here? Is what we are articulating ultimately to be understood as our

[15]Clearly enough, the position I am putting forward *in this thesis* is the product of a particular Subjective point of view in a particular context. It would certainly not be difficult to "deconstruct" my text. That is because, though I am using philosophical arguments, I have a particular practical or scientific aim in mind, rather than a purely philosophical one. The question I am posing in this section is whether it might be possible to elaborate a philosophical position, perhaps along similar lines, for which one could claim some universality.

> human response to our condition? Or is our articulation striving rather to be faithful to something beyond us, not explicable simply in terms of human response? ... If ... the ultimate basis of naturalism turns out to be a certain definition of agency and the background of worth, does the critique terminate with the proof that this is so..., or is there a way we can go on and rationally assess this and other definitions of worth?" (Taylor 1985:11-12)

Some of the statements made by the phenomenological philosophers in the previous chapter are very much open to these kinds of questions: whether, with their arguments against formalism, they are substituting *another* view or a *better* view. After all, the more their positions are regularised and systematised, the more they become influenced by the Subjective values of the particular philosopher. For example, Derrida's view that *differance* means that each term includes some of the meaning of its opposite is itself a very "systematic" view: why should the meanings included in a term fall so neatly into opposites and dichotomies, rather than into more ragged relationships, or no relationships at all? Derrida and Heidegger both make heavy use of the device of claiming that the views they put forward are in some sense implicit in the work of other writers. Is this because there is some kind of "truth" in their views? Or is it merely a legitimate rhetorical device? Or is it a use of hindsight, showing their own historicity, a sign of the ineluctible contingency of their own Subjective views?

Similarly, Heidegger makes several dichotomies in the course of presenting his view of human being: that between at-hand being and to-hand being for example. It would seem that this is at least not an exhaustive classification, and indeed there are some questions that arise with respect to the validity of his description of the categories (see Rouse 1985 for a discussion of issues related to this dichotomy). It seems to me, for example, unlikely that the "breakdown" of an item being used is the primary cause of change from a to-hand to an at-hand mode of being. Is this merely a minor point, requiring some elaboration of Heidegger's treatment (or an explanation of some misunderstanding on my part)? Or is it a sign of an inevitable incompletability of any philosophical view? If the latter, then it is tempting to speculate about the more fundamental dichotomies of his work: that between being and knowing, being an obvious one. Though his aim is to break down the distinction between them, is there a sense in which his own work relies upon it, as Husserl's is said to rely on the distinction between Subject and Object? If so, is there some other way of looking at things which avoids this dichotomy? Would it inevitably rest on some further, equally non-objective dichotomy?

These kinds of questions inevitably raise the meta-question of the role of philosophy and philosophers with respect to the rest of society. Do these kind of considerations make philosophy more divorced or less divorced from the practical concerns of life? Should philosophers pursue the kinds of questions raised here? Or leave them aside as unanswerable and turn towards more situated tasks, such as the unravelling of whatever conceptual issues arise in the natural or human sciences?

Interesting and perhaps relevant as some of these topics are, pursuing them here would

take me beyond the scope of a thesis on speech perception theory, so they must be left as provocative questions[16].

4.3.3. Implications for Scientific Enquiry

Radical antifoundationalism as a philosophical stance certainly does not imply either that "science" is impossible, or that some kind of "antifoundational science" - whatever that might mean - has to be developed. Philosophy and science are very different kinds of endeavours, though no doubt with considerable relevance to one another. I have said already that *local* foundations are not only possible but essential for any kind of organised, systematic, intersubjective knowledge: it is upon such local foundations that scientific frameworks are based.

Radical antifoundationalism does have implications for how scientific results should be viewed. It sees science as a Subjective enterprise - carried out by Subjects in cultural contexts - and situates any results within a local foundation of assumptions. No scientific endeavour can be undertaken except on the basis of some such local foundation - from a point of view - to give meaning to the domain, allowing Objects to exist as what they are in that context. Whether the framework is explicit or implicit, consistent or inconsistent, sensible or crazy, there must be some Subjective point of view (or several). Without it there could be no interpretation - "description", "observation". And certainly no "explanation" or "theory". No scientist works exclusively by pre-defined algorithm; there is always a strong element of "intuition" and interpretation (often involving hindsight) of the significances of the situation. It is at a later stage of development (or presentation) of a theory that it is formulated in explicit logical steps (*eg* Verhaar 1970). This is certainly not to downgrade the achievements of scientists; if anything it makes them more remarkable and admirable than an understanding of science as the rigorous following of a method allows. (See for personal accounts of this aspect of scientific endeavour, Medawar 1979, Feynman 1986, Polanyi 1966, and even Chomsky 1988:190.)

Nowadays, such an opinion is rather commonplace within philosophy of science, and even in science (Chapter 2). However, it is necessary to stress some implications of this view which are not always followed through in cognitivism, as I will demonstrate shortly. Seen this way, scientific results and theories are bound to the domain in which they were achieved. Within that domain they may be considered true, valid, or otherwise. Nothing that can be said about them in their own domain though can guarantee their status when they are transferred to another domain. Importantly, as has been seen, it is not just the results in terms of facts which are thus tied to their domain. More subtly, Objects, methods, and criteria are also constituted within a domain. For example the understanding of what is a "cause" and what

[16]See Rorty (1980), Llewelyn (1985, 1986), Staten (1985) Taylor, (1985), Judge (1985), Mitchell and Rosen (1983), for just a few of the interesting discussions on and around these questions.

an "effect" is not universally applicable, but tied to a particular background framework as seen from a Subjective point of view. "Rationality" itself cannot be given a universal or formal definition, in terms of externally applied rules or standards. Even the basic categorisation of Objects as "same" or "different", on which so much depends, cannot be done purely objectively.

It is therefore necessary in evaluating a framework to interrogate its Objects, criteria and methods in the context of the domain in which they were constituted, to appreciate the values of the point of view that make them what they are. This becomes particularly important in developing a new domain of scientific endeavour, or repairing one that is considered to have gone awry: attention should be paid to the validity of the entities, concepts, methods, criteria, etc, in terms of the new domain, whatever their status in some other domain, to determine whether they should still be considered valid. Rasmussen (1988) gives a very clear discussion of an issue of this sort with respect to the issue just mentioned of ascription of cause and effect, showing how the criteria used in assessing the cause of an accident can mean that blame is attached to, variously, a machine, the user of a machine, or the designer of the machine.

Naturally the particular criteria according to which a decision as to appropriacy of methods, etc, should be made cannot be specified universally, but must depend on the judgment of the Subject making it in the context. Radical antifoundationalism thus gives a very important role to the *judgment* of the scientist in particular contexts[17]. Rigour is of course desirable - and possible - but it is self-defined and self-imposed[18] within a domain.

A very significant dichotomy of scientific domains, in my opinion, is that between domains which do and do not include Subjects among the Objects of study. This would seem to be related to the often-discussed difference between the so-called natural sciences and human sciences. It is sometimes suggested that different general methods are relevant in these two domains. In particular, that where an "axiomatic" method - in which initial locally foundational facts are assumed, as axioms, and built upon by deduction - is appropriate for natural sciences, human sciences are better studied by a hermeneutic method. In the hermeneutic method, the subject-area is thought of as analogous to a text, and the task of the scientist as its interpretation (Taylor 1985, Mitchell and Rosen 1983).

Of course, there is considerable debate as to the general validity of such methods, as well as the possibility of studying human sciences according to natural science methods. There is some discussion, for example, as to whether the difference, if there is one, between these domains is due to the relative "maturity" of the two areas, rather than to the nature of their objects of study (*eg* Bateman 1983:49). This is not the place to enter into discussion of this

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[17]More so perhaps than the well-known anarchic philosopher of science, Feyerabend (*eg* 1975), allows.

[18]Not necessarily by each individual as a deliberated decision of course. The role of tradition and consensus is not to be ignored.

as a general point in philosophy of science, which would require definition and analysis of a range of human sciences.

I do wish to make the point however that in the context of a domain like speech perception research, Subjects cannot be treated as if they were like other (non-Subjective) Objects (and I suggest in Chapter 5 that in the particular case of speech perception research a hermeneutic-style method is a fruitful approach).

> "Human beings tend to construe themselves on the model of things. This does not mean, of course, that they overlook the ontological distinctions between 'person' and 'thing' entirely, but that they mistake what that distinction is; they tend to construe the distinction between 'person' and 'thing' as if it were a distinction between two classes of things..." (Schmitt 1969:206, explaining Heidegger's view)

In a domain with Subjects in the sense meant here it is necessary to have an understanding of the world in respect of Things as well as of Objects (for reasons which have been pointed out already but will be made more explicit below). In many domains, the point of view of the researchers can be more or less fixed, with an agreement not to question the validity of the perspective within the relevant domain; not to doubt what there is, for practical purposes, no reason to doubt (Spurling 1977:69). However, in studying a domain which includes Subjects, in the sense meant here, it is necessary precisely *to* question the perspective, to look at the World deliberately from different angles, to look at familiar Objects as Things. In particular, it is necessary to take into account that our society happens to give a very foundational status to the discoveries, descriptions, concepts, etc, of the natural sciences. This is because of our cultural values - point of view - not because these things really or objectively are what they are in the scientific domain. It is not the case that the "scientific" way of looking at the world is the only, the best or even necessarily the most scientific way.

Finally, several of the points made in this section can be summarised by introduction of a further terminological distinction necessary in domains which include Subjects among their Objects, that between Subject and Observer (or Researcher)[19]. The Observer here is a Subject in the full sense of the word as developed over the last chapters, with the additional aspect of point of view that it is a Subject trying to understand the nature of Subjects. The Subject is the Object of such an enquiry. It is essential not to confuse the point of view of these two, especially not to attribute Objects constituted from the Observer's point of view to the Subject. Much more will be said about this below, as I believe that many of the problems I find in cognitivism can be traced to just such a confusion.

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[19]A similar distinction is considered essential to the biological sciences by Maturana (*eg* 1978).

4.4. Subject and World in Cognitivist Philosophy

4.4.1. Introduction

In the discussion of Chapter 2, I began an argument that the symbol-manipulating Subject presupposed in cognitivism could only operate in a World of pre-constituted Objects - *ie* that it assumed a foundational World. Here I will develop and extend that argument with the background gained in the intervening discussion. First I will argue that despite a surface agreement with some aspects of the view I have put forward here, cognitivism is indeed foundational in non-trivial ways. Then I will show how this affects the Subject postulated by cognitivism, and argue that such a Subject simply could not do some of the things required of it - notably, of course, speech perception.

4.4.2. Cognitivist "Foundationalism"

Cognitivist philosophy, as has been seen, actually proclaims a relatively anti-foundationalist view itself. Some would perhaps agree in large part with the view given so far, and might well be surprised to find themselves described as "foundationalist". Despite this however, I will argue here, cognitivism's problems stem in large part from various kinds of "foundationalism" in its world-view.

One relatively straightforward aspect of this foundationalism is cognitivism's confusion between Subject's and Observer's point of view. This amounts to a "sedimentation" of a particular description of some aspect of the Subject or its world. For example, in speaking of language-for-the-Subject, it looks to descriptions gained in linguistics, the study of language-for-the-Observer; in speaking of thinking-for-the-Subject, it looks to descriptions in terms of "mental states", again, description by an Observer. Even in accepting the dichotomy of the whole person into mind and body, it sediments a self-reflective description. In using methods and criteria of the natural sciences, it is accepting these as genarally valid, beyond the domain in which they were constituted[20].

A more important kind of foundationalism is connected with the central tenet, monism, which, as pointed out briefly at the end of Chapter 2, has precisely the force of making a description from the point of view of the physical sciences into a foundation. Although the intention of monism is the claim that only material things exist, as interpreted by cognitivist philosophy, monism implies that one aspect or description - a physical one - is more salient, basic or real, no matter what the context. Actually, though, the issue here is somewhat complicated by the confusion, also pointed out in Chapter 2, involved in cognitivist philosophy's actual

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[20]These kinds of importations could of course be defended as being transfers between domains with sufficient similarities to make them appropriate, rather than ascription of universality. I will not argue against this opinion; conceding the point would not affect my argument here, since it is not the motivation for the transfer, but its appropriacy that is the point at issue.

implementation of its principle of monism. On the one hand cognitivist philosophy depends on various differences in the kinds of entities in its framework - the difference between for example a thing, a symbol and a symbol-user - which it cannot account for satisfactorily because it concentrates only on their material/physical properties. On the other, cognitivism depends on various kinds of non-material "entities" - *eg* functions, features, abstract processes - being included in the realm of the "material". So ultimately the force of monism as it operates in cognitivist philosophy practice is that a *set* of descriptions, rather than a single description, are deemed basic. Nevertheless, it is a pre-defined set of categories that are given this privileged status in cognitivism - though without the tacit background understanding of a cognitivist philosopher it is hard to find a simple rationale for selecting the members of the sets. There is no scope for the idea that in interacting with the World, the Subject interprets uncategorised Things according to the current context and point of view. To account for the flexibility of interpretation, cognitivism has to postulate a conversion by the Subject of one Object into another. I will give examples of the operation of this kind of foundationalism in speech perception research in Chapter 5.

The third, related, sense in which cognitivist philosophy is foundational, is the one most central to the overall trend of my argument. The whole framework of cognitivist philosophy depends upon the understanding that at least some things in the world must simply exist as, in themselves, what they are. Although they might sometimes be seen differently in different contexts, that is a transformation of their more fundamental nature. These are the "raw data" and the abstract functional processes that cognitivism's Subject operates with. This is the way cognitivism's view of the World and the Subject are intertwined: its Subject must be able to symbolise features of the World at "low levels", therefore the existence of such features as what they are is implied. The burden of my argument so far, however, has been that this is impossible. There can be no representation without a point of view of the kind described above. This point is made at length by Judge (1985). Interestingly her philosophy does incorporate centrally a representational view of human thought and language. The argument I am making here is not against the idea that cognition is representational. It is against the particular understanding of the nature of representational thought put forward by cognitivism: if you want a representational theory of cognition, you need a Subject which can make and use representations. This I claim cognitivism's Subject could not do.

4.4.3. The Subject in Cognitivist Philosophy

4.4.3.1. Symbol-Manipulator

It will be recalled that I started the argument against cognitivism by showing a particular kind of inadequacy of the Subject it postulates: crucial stages of the symbol-manipulating process - constitution of Objects, attachment of symbol, interpretation of transformed symbol - require a kind of background understanding of the meaningful situation, which understanding cannot itself be explained as symbol-manipulation.

From the present perspective it is possible to see more clearly what is at stake here. I pointed out at the end of Chapter 2 that cognitivist philosophy operated on the assumption that small entities with physical descriptions in regular or well-defined relations were "more concrete"[21] or "lower level" than larger things defined in terms of vaguer meanings - and I argued that this is an erroneous assumption, because a physical description does not make a thing any more "concrete" than any other kind of description.

I can now expand this point by recalling (from Sec. 4.2.2) that from the *Subject's* point of view, the relationship of abstract to concrete is the reverse of what it is in cognitivism's assumption. The larger meaningful things in vague and complex relationships are the Objects that emerge for the Subject. The smaller, well-defined ones in regular or simple relationships are the products of abstraction, idealisation and refinement, according to a background understanding and purpose[22].

This is an example of the operation of precisely the confusion between Subject's and Observer's perspectives that I described above, a species of foundationalism. The Observer reflects and describes according to criteria and values, and then, forgetting the role of his or her own point of view in constituting the Objects that result, creates an ontological hierarchy of those Objects according to Subjective criteria like size of unit or vocabulary of description. My argument here is that the ontological hierarchy more relevant to the Subject is one that takes into consideration the process of constitution itself, rather than one of already-constituted Objects, ranked according to the values of the Observer.

Whereas cognitivism's Subject goes through processes of recognising and combining small meaningless entities into larger ones which can be associated with meanings, the interpreting Subject goes through processes of analysing larger Objects which have emerged as meaningful from a background of meanings, into smaller more regular sets, meaningful in a different kind of way, against a different background. The background of meaningfulness, it will be recalled, is necessary even for such "fundamental" classifications as "same/different"[23]. The Subject's "creativity" is thus about constitution and reconstitution of Objects and relations between them from a changing background of the meaningfulness of the World in the Subject's (changeable) point of view. "Creativity" seen in terms of formal tokens and rules of logic for their manipulation is something quite different - valid enough[24] but it could never achieve the cognitive abilities of the human Subject.

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[21]Even though it might be an abstract or functional entity.

[22]Compare the discussion of the "three worlds of perception" in Merleau-Ponty's philosophy in Spurling (1977:32ff), which, though having a slightly different emphasis, is similar in spirit to my discussion here.

[23]Lundh (1983) develops his alternative framework (different from the one I am putting forward here) on a similar understanding: "... similarities, just like everything else, are perceived in terms of meaning structure..." (Lundh 1983:73).

[24]I should perhaps reiterate that I am not suggesting here that people *never* use symbols and processes in reasoning; only that this could not be the basis of all our reasoning and other cognitive processes.

So the interesting thing about human cognition from this perspective is not how Subjects manipulate representations of Objects, but how they constitute Objects as what they are (for the time being) from a background of meaningfulness which does not already include Objects. Understanding that, I argue, requires postulation of a Subject like the one described above. Whether it is best understood in terms of some sense of 'representing', as Judge would argue, is a matter for debate; my claim is that it should not be understood as representation in the sense cognitive science means the term.

If I am right in this, it becomes clear why the two major problems (recall Chapter 2) for cognitive philosophy are provision of accounts of consciousness and meaning, which I will treat next, in turn.

4.4.3.2. Consciousness

Firstly, "consciousness" is not a separable, definable "characteristic" or property which entities might or might not have or be given. It is not something that "intelligent" entities might or might not have; an extra feature of human beings that a good theory of cognition ought ultimately to be able to account for, but that intermediate theories can put to one side for the time being. The "property" we call our "consciousness" is an essential part of our nature as living and self-reflective beings. Thus it is not something to be *explained* by an account of cognition; it is part of the explanation *of* cognition. Any explanation of "consciousness" would have to be in another domain, in which it was not presupposed by the terms of the explanation.

I am putting the word "consciousness" in scare quotes here because it is not a word that fits neatly into the vocabulary of the account of Subjectivity I am developing. It does not comprise a natural division of our nature. Rather it cuts across other, more relevant, classifications. This I believe is the reason that cognitivism has so much trouble with the definition of consciousness, and the decision as to whether it is an essential feature of intelligent systems (*cf* Chapter 2)[25]. The particular definition and connotations "consciousness" has depends on the context in which and point of view from which the abstraction is made. Thus the word has different meanings depending on how and when it is used: for example in contrast with "unconscious", "non-conscious", "sub-conscious", "pre-conscious", and so on.

The attempt to clarify the issue by substituting the term "intentionality" I think can fairly be

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[25]It will be recalled that Searle (*eg* 1984) is an example of a philosopher who takes an anti-AI stance based on the opinion that consciousness or intentionality is a necessary prerequisite for true intelligence. Thus he believes that the difference between machines and humans is that humans really have intentional mental states, whereas machines are only imputed intentionality by humans. He demonstrates the difference with the "Chinese Room" example (which I believe addresses adequately neither the cognitivist position nor the kind of position I am putting forward here). This view allows him to keep all the parts of cognitivist philosophy that appeal to "common sense" views of the world (in fact Searle frequently uses common sense or "obvious facts" in support of his arguments) while opposing the arguments of "strong AI". In my opinion, this involves him in significant incoherence of ontology and epistemology, for just the reason that "consciousness" is not itself one of the essential characteristics of Subjectivity, but an abstraction derived from more fundamental characteristics.

said to have failed, since "intentionality" now has nearly as many meanings as "consciousness" - some of which were pointed out in passing through chapters 2 and 3; and has changed very considerably from its original intentions in the course of translation into a form suitable to cognitivism (Chisholm 1960; Dennett 1972). Any definitions or explanations of "intentionality" rely greatly on the fact that we can "catch on" to what is meant. To say that intentionality is "aboutness" or "having a content" means almost nothing in itself. Aboutness and content are both being used in very idiosyncratic, non-literal ways. I conclude then that while "consciousness" is a bad term to use, "intentionality" is no better.

Another important contrast between my view and that of cognitivism can be seen in the relationship between subconscious and conscious processing. Cognitivism considers that the kind of processing that takes place "below the level of conscious awareness" is of the same nature as that which we do consciously (Chapter 2). I claim, by contrast, that the "subconscious processing" *must* be different from conscious reasoning using external symbols.

Our "conscious awareness" of ourselves is, like our description of everything else, an interpretation of an aspect of the World from a point of view. We can claim no special "rightness" for the *particular* descriptions we give to aspects of consciousness[26]. When we "look inward" what we describe is partly a product of our point of view in exactly the way that is true of the descriptions we make when we look outward.

The "introspectionists" are of course well known for making the error of claiming reliability for their view of the workings of their minds[27]. But they are not the only ones who make this error. Husserl as was seen in Chapter 3 placed heavy reliance on the notion of "presence" of an Object to consciousness, despite his criticism of philosophers of the Natural Attitude who did exactly the same with respect to things in the world. More importantly, for present concerns, cognitivism makes an entirely analogous error when it gives equally heavy reliance to the notion of representation and belief. To look inwards and explain behaviour on the basis of desires, fears, knowledge, goals is to make an interpretation - description - of what one "sees". Such an interpretation is a perfectly adequate description for everyday purposes. But to use that interpretation in the very different domain of cognitive psychology is, once again, to confound the Subject's and Observer's points of view, to "sediment" an interpretation and suggest that there is something "real" about the particular categories

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[26]Though clearly this is different from claiming the *general* existence in the World of whatever-it-is that we call consciousness. "...when we ask what distinguishes persons from other agents, consciousness is unquestionably part of the answer. But not consciousness understood as just ... the power to frame representations of independent objects. Consciousness ... is as it were the medium within which they first arise as concerns for us. The medium here is in some way inseparable from the content; which is why .. our self-understanding ... is constitutive of what we feel." (Taylor 1985:103).

[27]Brentano's variation on the theme, mentioned in Chapter 3, suggested that in treating consciousness as an activity rather than a container he was able to overcome the problem and claim infallibility of inner perception. According to the argument I have given here, this is not a valid claim.

"belief", "fear", "goal" and so on[28].

4.4.3.3. Meaning

It will be recalled that meaning, like consciousness, is one of the topics that is most difficult for cognitivism to come to grips with in filling out its understanding of cognition as symbol-manipulation. The fact that this should be so can also be understood in the light of the preceding discussion. There are two major kinds of problem with cognitive science's treatment of meaning, both of which are directly attributable to the understanding it has of the nature of the Subject and the World.

First, cognitivism, as will be recalled from Chapter 2, sees meaning as something associated with some otherwise meaningless form, whether a linguistic form, or the form of objects in the world. Much of the debate in cognitive science concerns the problem of how to characterise the meanings and the relationship of meanings to forms. Most of the problematic of cognitivist research on perception is, as has been seen, motivated by the need, in their scheme of things, for the Subject's processing system to change the form from what is given in the stimulus into something that can be matched in memory.

But of course the idea of a meaningless form has now been shown to be incoherent; it suggests that such Objects simply exist as what they are, irrespective of any point of view - a foundationalist assumption. For a form itself to exist as what it is, it must be meaningful to the Subject. The reason cognitivism has trouble deciding the relationship of form to meaning is similar to the reason it has trouble deciding the relationship of mind to body: they are not two separate things, joined together as halves forming a whole. They are aspects of a whole which is more than the sum of these two parts, and in which the two parts are not already differentiated prior to the abstraction by a Subject that brings them into being. To understand the relationship of form to meaning requires understanding the Subject's relationship with the whole from which they are derived. In this case, the form that is "meaningless" to cognitivism's Subject is meaningful (as an ideal or abstract Object) to the Observer. Thus we have here another kind of way in which cognitivism confuses the perspective of the Subject and the Observer (or researcher): the cognitivist Observer abstracts two aspects of a whole, Objectifies them, and then incorporates them as already constituted into a theory of the Subject. I hope to clarify and exemplify this point in several places below (notably in the Sections on Perception and Language in this chapter, and in detail with respect to the IP account of speech perception in Chapter 5).

The second major kind of problem, clearly related to the first, is that cognitivism sees a meaning as something *definite* associated with a form. The whole point about meaning, in the view I am putting forward here, is that explicit, definite meanings are constituted by

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[28]A problem not often addressed by cognitivism is that of the definition of these categories as such; what is there that distinguishes all beliefs from all fears or all goals, that does not make use of our common understanding of how to use the English language?

Subjects, in contexts, from a background of (inexplicit) meaningfulness. To put the definite meanings already constituted into a theory of the Subject in the way that cognitivism does, is to deny the Subject the flexibility and creativity that are at the heart of human cognition. Certainly cognitivists realise this. As was seen in Chapter 2, a great deal of their research is devoted to the problem of how to give their Subject back the kind of flexibility that this conception takes away from it. Again, more will be made of this point at appropriate places below.

These two insufficiencies in cognitivism's account of meaning are, I believe at the heart of its problems in accounting for the way its Subject interacts with the World. They are caused by its inability to account for the *origin* of anything meaningful at all in the World, which in turn is related to its understanding of what it is to be a Subject in a meaningful relationship with the World, as discussed above.

4.5. Reappraisal of Cognitivist Framework for Speech Perception

4.5.1. Introduction

In this section, I will point out the implications of the view given in this chapter for some areas of cognitivist philosophy discussed in Chapter 2, which have particular relevance for speech perception theory. I will do this rather briefly here, since I will largely be exemplifying points already made, and the ways in which they are relevant will be made more explicit in the following chapter.

At the end of Chapter 2, I suggested that cognitivist philosophy's pre-theoretical commitments as to the nature of the Subject and the World could be seen as the source of various of the more explicitly stated tenets. In this present section I will expand on the relation between these deep assumptions and some of the features of cognitivist philosophy set out in Chapter 2. The general direction of this section's discussion will be towards the claim that it is the stance taken on these two issues that gives cognitivist philosophy the features that make it inappropriate as a background framework for understanding human speech perception. Thus it will be evident that in each case, a feature of the cognitivist view can be traced to the underlying position with respect to Subject and World that I have been discussing up till now. Many of the problems of cognitivism seen and discussed by its own practitioners can then be seen as symptoms, whose cure requires treatment of the cause at this deeper level. This will lead me to the suggestion that a change in orientation at this level would provide a good starting point for a new and perhaps fruitful alternative framework for the study of human cognition.

4.5.2. Perception

Cognitivism's general account of perception will be recalled as: the transformation of a stimulus, according to computational rules, to allow the matching of input with a form stored in memory, and thus the accessing of the meaning of the stimulus.

The problems with this view from the point of view of this thesis have now been brought out clearly. Firstly, the description of the stimulus (meaningless form, usually in terms of the physics of light or sound) is made from the Observer's point of view, rather than the Subject's, according to the Observer's background understanding of the meaningfulness of the perceived Object and the criteria and values of a scientific description of the World. Certainly, as already argued, the Subject cannot be said to be perceiving a "meaningless form", at any "level of description". Thus the "lowest level" description of the World attributed to cognitivism's Subject is quite an arbitrary description from the point of view of the perceiving Subject. When it is recalled that this description is (part of) what motivates the postulation of processes to transform the input into a matchable form, this can be seen to be a significant point[29].

Similarly, the description of the "stored" canonical forms into which the stimulus has, according to cognitivism, to be transformed for recognition is an idealisation made by an Observer from a background understanding of the whole context; they are constituted by processes of abstraction and idealisation based on experience of many examples. Here again, the choice of stored forms has a profound effect on the need for postulation of a processing mechanism.

Ultimately, then, the cognitivist view of perception as involving matching of forms is incoherent. It has has already been shown (Chapter 2) that the kind of "matching" that is required cannot be achieved without the kind of background understanding that is supposedly being explained by the symbol-manipulation mechanism (and which I have argued a purely symbol-manipulating Subject can never have). Now it can be added that this kind of matching is not just impossible for a symbol-manipulating Subject, but unnecessary for the kind of Subject that could have a meaningful relationship with the World. The stimulus form and the canonical form are not relevant to such a Subject's perception; there is no need to transform one into the other. The description of the World that is relevant to the Subject is already meaningful. In particular, for Subjects - *eg* IP researchers - to formulate the symbol-manipulation theory, they must themselves have an understanding of the meaningful situations in order to describe the "forms" and "meanings" and "rules".

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[29]It is interesting to note a close similarity between cognitivism and Husserlian phenomenology here. Each of them, from their very different perspectives, starts from the assertion that it is "indubitable" that what is given, in, say reading a page, is a collection of squiggly black marks (Spiegelberg 1982:126; Neisser 1976). The point is, that, indubitable as the experience may be, what is given is not given *as* "squiggly black marks". It is given as an uninterpreted Thing.

This general view of perception has a major effect on the kinds of problems cognitivism faces, and which cause the difficult issues discussed in Chapters 1 and 2 - of architecture, processes, knowledge, integration, interpretation, and so on. For example, cognitive philosophy is certainly right to attribute knowledge to the Subject as an essential characteristic (compared to behaviourism). But here again there is a confusion between the *Observer's description* of the knowledge the Subject needs or has, and that knowledge from the Subject's own perspective. This has two sides, one to do with the kinds of knowledge postulated, and one to do with the form that the knowledge is presumed to take. Firstly, much of the detailed knowledge is postulated because it is considered necessary for transformation of the stimulus into the canonical form. If that is not seen as the major part of the Subject's task, the knowledge is not needed. Secondly, the cognitivist Subject's knowledge is definite and explicit. This is because it is an explicit description of knowledge by an Observer. Recall the problems cognitivism has in this area, and the attempts to develop models of knowledge that allow more fluid application, content-addressability, and so on. From the perspective being developed here, the Subject's knowledge is, at bottom, fluid and inexplicit, and has no separation between form and content to cause problems of "access". "Knowledge" itself is a word in a language, which cannot be taken to refer to a pre-existing definite part of the World; the fact that in our particular language it is a noun should not mislead us into assuming that it is a "thing" stored in a "place".

More detailed application of these points about perception will be given in the following chapter with specific reference to speech perception.

4.5.3. Language and Communication

Language for the Subject, in the view I am developing here, is not something it *has* or *does* but an integral part of what it *is*. Any description of language as an entity or system in its own right will inevitably be incomplete, since it must be an abstraction made in an act of reflection. More importantly, any such description must imply the existence of a Subjective point of view from which it is made.

Recall cognitivism's view of language as a system of relations between sounds and meanings. This conception of language rests necessarily on two dichotomies - that of sound from meaning, and that of language from thought. In both cases, the argument of this chapter and the last has been towards the conclusion that, valid and useful as these dichotomies are for many purposes, they cannot be considered basic *from the point of view of the language-using Subject.* I will discuss them here in turn.

First, consider cognitivism's separation of sound and meaning, or form and content:

> "... earlier views, those of Hobbes or Locke for instance, ... understood meaning in terms of designation. Discovering the meanings of words is finding out what ideas or things they stood for. We are much more sophisticated in the twentieth century, and especially in the English speaking philosophical world, which has been through the Fregean revolution. But some of the basic ideas of the Hobbes-Locke tradition still survive in transposed form. With

> truth-conditional theories of meaning, for instance, we still have the basic notion that meaning is to be understood in terms of the things language is used to talk about. The crucial unit is now the sentence and not the word, and relations like 'making true' and 'satisfying' replace the earlier emphasis on designation ..., but meaning is still explicated by some notion of representation; the meaning of a word is to be explained by the way it can be used to *depict* the world." (Taylor 1985:9, his emphasis)

All of linguistics, whether the linguistics of Saussure, Bloomfield or Chomsky, rests on this separation of sound (or form) from meaning. Much of linguistics has to do with the problem of the way that these two aspects of language are related to each other - in fact the differences between schools of linguistics can be described in terms of how this relationship is seen.

However, this separation is an abstraction which depends on an understanding of language as a Whole[30] - a Whole in which the two are not already distinct, and which involves more than just these two parts[31]. Valid as it is for linguists to operate with the distinction of the Whole into those parts, it is not valid to consider these two Objects as already constituted as separate entities for the Subject[32], or to see the Subject's use of language as involving a bringing together of the two. To do so is to confuse an Object constituted by a Subject (Observer) with something given in Reality. No linguistics could be done without a background understanding of the meaningfulness of the Whole of language (*ie* a Whole which comprises both sound and meaning before their abstraction and constitution as Objects). That is the kind of linguistic meaningfulness that is relevant to the Subject[33]. At that level the sound and the meaning are not separate; they are certainly not in an arbitrary relationship. Though the arbitrariness of this relationship is a fundamental tenet of linguistics, it is an arbitrariness of a special kind, not relevant when the domain is changed to that of language for the Subject.

Saussure of course made a point similar to this one - he emphasised the fact that the sign was a whole consisting of both signifier and signified, and that neither could exist without the other, as one side of a piece of paper cannot exist without the other. My point here is somewhat different however. I am claiming that, for the Subject, the two are not separate but

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[30]I will use "Whole" in the general sense of a unity from which Objects are abstracted; the term is closely related to "Thing" which has been used up till now, merely emphasising a different characteristic. In the case being discussed here, that means speech or language as "linguistically-meaningful-forms". It should not be taken to suggest that there is some defined "whole language" which a Subject has to know before it can understand any part of language.

[31]It might be worth digressing here briefly to point out an important difference between "Whole" as meant here and the "whole" of a "holism" sometimes discussed in cognitivism (*eg* Minsky 1987). Holism in that sense is the claim that the whole is made up not just of atomic parts but of the parts plus some specified extras, such as their "functions". The point about the Whole as I mean it here is that it is not possible to state what the "extras" are in themselves (*eg* "function" arises in relation to a Subject). Any Object or description is an abstraction from a Whole. Decisions as to what is basic and what is extra involve Subjective judgment.

[32]Goldberg (1981) likens the meaning of a sentence to the humour of the sentence, emphasising that to speak of meaning as an entity is already to speak of something very abstract.

[33]And it is this Whole which is represented by writing, alphabetic or otherwise, not the sound alone - a point made at length by Harris (1986).

are derived from a Whole, bigger than the sum of these two parts, which includes both as aspects or features, not entities.

This is precisely the reason that defining the relationship between sound and meaning is a problem for linguistics: meanings are not stable things that exist separately from their embodiment in language. In order for there to be such an Object as a word's "meaning" or it's "sound", there must be a Subject who understands the whole word. A word is not a complex entity made up of two conjoined but separate parts; it is a Whole in which the two are not distinct, but of which they are aspects, and from which they can be abstracted and Objectified.

Cognitivism does more than treat sound and meaning as two separate entities related or combined to form language-as-a-Whole, whose relationship must be discovered or specified by researchers. It makes further abstractions and idealisations of both entities, constituting as Objects various small units of sound and meaning, and, again, working to discover or specify the (regular, formal) relationships among these Objects (phonemes, morphemes, features, semantic primitives, etc). Thus cognitivism sees language as system made up of groupings of small bits into bigger bits, and the bigger bits into yet bigger bits. The perspective of this chapter gives a very different view: it sees language-for-the-Subject as, at the most "concrete" level, patterns of meaningful units. The smaller, meaningless units are derived by abstraction from these meaningful units. The exercise of arranging the abstracted Objects into regular or formal patterns is a valuable one with many uses. But the patterns and Objects thus achieved should not be considered "more concrete" or "lower level" *for the Subject of a speech perception theory.*

As for the separation of language from thought, much has been said already about the need, in the perspective being developed in this thesis, to see language as manifesting and articulating thought, not translating it.

Cognitive philosophy's view of language is made possible only by the focus of attention on particular types of language and language-use as central examples: the literal statement, transferral of information, etc. Other views of language, including some put forward by cognitivists, or found attractive by cognitivists (as was seen in Chapter 2) have made strong cases that this focus is unjustified and restrictive, but it has proved difficult to adapt the cognitivist view to incorporate these criticisms. While it is possible to explain cognitivist philosophy's explicit, rule-governed system of language in terms of the vague, inter-subjective uses that, say, Merleau-Ponty sees as central, the opposite derivation, I argue, is not feasible.

Finally, consider the cognitivist understanding of the nature of communication, which is powerfully influenced by its understanding of the nature of language, as a packaging of an idea (meaning) into linguistic form, and the form into a sound, and the retrieval by the hearer of the form from the sound and the meaning from the form. Again, the present perspective

makes natural a very different understanding of communication. The same kind of paradoxical situation exists here as has been met before: on the one hand linguistic communication is only possible if it is embedded in a larger kind of "discourse" or sharing of Life-world; on the other, we cannot share *explicit* definite constituted meanings, since each person has to constitute them him or herself. Thus what we share that enables communication is not a neat system of sound-meaning pairs; but rather the kind of understanding from which such pairs can be defined[34]. In communication, there is no transfer of a definite meaning from one head to another. Rather a speaker articulates something on the basis of an understanding of the world, the situation, the addressee, and so on; and the hearer interprets the expression according to an understanding of the world, the situation, the speaker, and so on. (Clearly, then, the units of such communication are not seen as small, formal, linguists' Objects, but as a series of entities meaningful to the Subjects involved.) The times when meanings seem to be shared are better seen as special cases of the general case that meaning is individual. Again this turns cognitivist philosophy's view of "central vs peripheral" around. And again, accounting for the times when communication seems like "message-transfer" is much easier this way, than an account of Kundera's "susurrus" is for cognitivist philosophy[35].

If communication is not a mechanical process of encoding and decoding, it becomes clear that the ability to communicate implies a certain kind of Subject - it cannot be done by mere symbol-manipulators. Communication requires an addressee who can "catch on" to the meaning, which will necessarily be inexplicit and incomplete. Wittgenstein makes much of this point with his undermining of the belief that "knowing how to go on" (or understanding) consists in operating according to a rule. Similarly, Derrida (*eg* 1977) recommends that written, rather than spoken, communication should be taken to be the norm: this would help undermine the belief that in face-to-face communication, the message transfer is accurate, and only in understanding of texts, when the author is not present, are there difficulties of interpretation. There is a sense, he says, in which the "author" is "absent" in all communication. An interpretation is always the interpretation from the receiver's point of view; there is no way to make a real comparison of intended and received meanings.

So far I have dwelt mainly on the impossibility of "meaning transfer" in the sense that underlies most speech perception research. This should not give the impression that there is no possibility of mutual understanding. On the contrary, the other half of the view given above is that communication is only possible when there exists understanding. Communication is thus often a highly cooperative enterprise, with the participants using their

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[34]"... it is speech, above all, which develops, expands and puts flesh on the seed of intersubjectivity latent in all experience." (Spurling 1977:52)

[35]"Now, perhaps, we are in a better position to understand the abyss separating Sabina and Franz: he listened eagerly to the story of her life, and she was equally eager to hear the story of his, but although they had a clear understanding of the logical meaning of the words they exchanged, they failed to hear the semantic susurrus of the river flowing through them." (Milan Kundera *The Unbearable Lightness of Being* Part 3, Chapter 2).

understanding of each other's Subjectivity, and the situation, to guide each other's understanding through language. This topic will be taken up again in the following chapter.

4.5.4. Intelligence

Cognitivism develops out of a tradition which puts very high store on rationality and intelligence (Rorty 1980, Taylor 1985, Polanyi 1958). It was seen in Chapter 2 that intelligence is considered by cognitive philosophy to be a characteristic separate from other attributes of an entity - in fact cognitive science is more interested in the study of intelligence as such, than in the study of the beings which exhibit intelligence.

From the perspective of this chapter, a very different view arises. The situation is similar to that discussed in relation to "consciousness" above. Intelligence is not a separable or definable characteristic, except insofar as a particular point of view in a context allows this. When we speak of the "intelligence" of a person, we mean different things in different contexts. It is often, for example, a complimentary term, having political and other connotations.

To define and explain intelligence or rationality in terms of some evolutionary advantage it confers assumes, like all such explanations, the direction that evolution has taken, a particular understanding of what constitutes "survival", and values as to characteristics that confer survival. In other words, "intelligence" is a characteristic that we like and that we see as the cause of the aspects of our survival that we like when compared to that of crocodiles, cockroaches or other creatures which have survived a long time.

This view, it should perhaps be noted, does not imply that computers "are not" intelligent. We can call them intelligent. But this should not mislead us into equating "intelligence" in the domain of computers with "intelligence" of human beings, or into assumption of "similarity" at a deep level. Even among humans, as just noted, "intelligent" does not have a clear and unambiguous definition. Speaking of the "intelligence" of a computer system is using the term in quite another domain. It is not wrong to do so, or even misleading, unless the mistake is made of thinking that because the same word is used, it must have the same connotations and implications.

A computer is certainly not "intelligent" *in the same way as* a human being is intelligent, for all the reasons I have used to explain why cognitive science's Subject is inadequate as an understanding of human beings. To make some (inanimate) thing intelligent-like-human-beings would mean giving it a Subjectivity - a point of view. Doing that would not necessarily give us what we wanted in the way of intelligent machines, since these created entities would also have other characteristics of Subjectivity that we might find less useful in a machine[36].

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[36]"Who would want ... a machine ... which is no more predictable than the human being who made it." (Rychlak 1976:219)

I would like to stress that nothing I have said in this entire thesis has any implications for, or makes any predictions about, the kinds of computing machinery that will or might be developed in the future. Unlike Dreyfus (1972), I am not concerned about what computers can't or won't "do"; I am interested in what humans can and do do. Development of "intelligent" computing machinery would appear to be in general a useful and interesting pursuit, though I believe the erroneous equation of human and machine intelligence can do little but hinder the enterprise. "Knowledge-based systems", in my opinion, reflect the knowledge of their designers; they do not themselves "have knowledge". I am in sympathy with those who believe that, for example, expert systems are more useful if they are designed to complement rather than mimic human capabilities. As Winograd and Flores (1986) suggest, rather than aim to discover what computers can do, we should consider how computers can be used - what we can do with computers. (On this topic, see also Blokland 1984, Winograd and Flores 1986.)

4.6. The Two Alternatives

4.6.1. Introduction

The two major alternatives to the IP approach to speech perception discussed at the end of Chapter 1, have, as mentioned in Chapter 2, philosophical frameworks which stand in some sense as rivals to that of cognitive science. It is worth considering whether either or both of them offer solutions to the problems that I hope to have raised for cognitivism in this chapter[37]. In this section I will argue briefly that they do not. Each focuses on a particular aspect of cognitivism's problem, without, in my opinion, reaching the key to understanding the origin of the difficulties. Thus, while each is useful in certain respects, the insufficiency of their analyses means that the alternatives they offer retain some of the crucial features of cognitivism.

4.6.2. Parallel Distributed Processing

PDP was introduced briefly in Chapter 1, in setting out its alternative approach to speech perception research. It is relevant here to consider its philosophical framework, in relation to the one I am developing in this thesis.

In fact, the philosophy behind PDP is virtually identical to that of cognitivism as set out in Chapter 2 with respect to the issues I have raised in this chapter. The major difference between the two approaches is in the *mechanisms* of cognition they propose. PDP is certainly different at that level: opposing the cognitivist view of cognition as symbol

[37] I will discuss these philosophical alternatives briefly here in the light of the perspective being developed. Consideration of the effects the different frameworks have on how speech perception research itself is conducted will be reserved for Chapter 5.

manipulation, and seeing it instead as patterns of activity in massive arrays of simple units linked by connections which propagate the activity to adjacent nodes. This difference has an important philosophical effect - it avoids one of the homunculus problems I raised at the end of Chapter 2. If there are no levels of symbol manipulation, the problem (that symbol manipulation requires background understanding of the kind symbol manipulation is purported to explain) does not arise. Similarly, the fact that the system's "knowledge", being stored in the weights of the connections, can be apparent without being explicitly represented in propositional form, is also an advantage, overcoming some of the difficulties of the regress of knowledge needed to apply knowledge, and decisions about which kinds of knowledge are represented and which inferred.

However, in other respects, the PDP framework is the same as that of cognitivism, and suffers from analogous philosophical problems, when considered as a general account of human cognition. It is still representational in the sense that it is a mechanism for achieving representations of input. Thus it still requires a homunculus in the form of a programmer, particularly to interpret (give meaning to) the nodes in the speech perception model as representing features, phonemes and words (see Section 2.6.1.2 above). It does not address at all issues of Subjectivity, meaning[38], "consciousness", "control" as they have been raised in this chapter and the last. Thus PDP retains the framework of cognitivism, and its basic questions about cognition: it differs in the way those questions are answered. It is an innovation on the level of *mechanism*. This is, of course, not a denigration of that innovation: its usefulness in AI applications (where the cognitivist framework assumptions are relevant) is not questioned. In any case, many PDP researchers do not make any claims beyond this. It is however important to be clear that hopes that PDP overcomes the problems of cognitivism as a general account of human cognitive abilities would be unwarranted.

There is another recent innovation which bears some resemblance to PDP but is more explicitly philosophical in orientation, which can perhaps usefully be mentioned in this context. This is represented by Churchland's "neurophilosophy" (1986). Churchland has a strong commitment to the principle that the brain and the mind are identical (*cf* Chapter 2 above); in fact she generally uses the term "brain/mind" to make this explicit. Her goal is a unified science of the brain/mind which includes all levels of description. Thus the fundamental tenet of neurophilosophy is the belief that neuroscience is relevant to philosophy.

> "...neuroscience will undoubtedly change out of all recognition a host of orthodoxies beloved in philosophy. Barring a miracle (or a calcified stubbornness), it will in particular transfigure epistemology, as we discover what it really means for brains to learn, to theorise, to know, to represent. Neuroscience may even teach us a substantial thing or two about how science and mathematics are themselves possible for our species." (Churchland 1986:482)

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[38]This is shown well by an informal, but telling, remark of J. Hinton's (on the television interview "Voices" shown by the BBC on 19th April 1988) "I don't think there's anything about biological stuff that makes meaning stick to it any better than it sticks to silicon stuff".

Churchland shares my criticism of cognitivism's reliance on sentence-like symbols and reasoning as the basis of cognition, but for different reasons and with a different solution. She sees cognitivism as relying too heavily on the principles of "folk psychology" and ordinary language:

> "Folk psychology has no more epistemological privilege than folk physics." (Churchland 1986:312)

She believes instead that with better knowledge of neurology, we will be able to develop a more perspicuous vocabulary for mental (*ie* brain) states, and that this will eventually help us to discover what we, as human beings, really *are*.

Clearly, this is a very different view from the one I am developing in this thesis, and in some respects opposed to it. It is quite explicitly making a definite (and rather general) foundation, whereas I have argued the need to account for the ability of Subjects to make foundations. No doubt Churchland would respond that such an account should be given in terms of neurology. We must await developments in both areas to find points of confrontation. Perhaps the two approaches will simply pass each other by.

4.6.3. Direct Perception

Direct Perception has also been briefly described in Chapter 1 in relation to its use as an account of human speech perception. In fact, it is only rather recently that the DP approach has been extended to provide so detailed an account of speech perception as such (though speech perception has been mentioned in earlier works). The general DP approach was developed by the psychologist, James J. Gibson (1966, 1979, Shaw and Bransford 1977), in opposition to the computational style of understanding[39]. The main focus of disagreement is that IP-style models postulate too much internal processing or computation; they are too "mental" and intellectual. All the computation is found to be necessitated by the way these models choose to describe the stimulus, relative to the observer, rather than to the perceiving organism. It is because of this initial description that the computational view of perception is forced to postulate that the stimulus is processed, to change it from a series of static presentations of physical "cues" into information which the animal can use in the pursuit of food, shelter, support, danger, and so on.

In the DP account the organism perceives, not according to the language of physics, but according to the "affordances" (opportunities) the environment presents *to the organism*. The theory which develops from this framework is based around the claim that if the stimulus is described appropriately, in respect of the organism rather than the physicist, and including the time-dimension, then the affordances of the environment for the organism will be *specified* by *invariant* features of the stimulus, and the organism need only "pick them up"

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[39]Gibson's work started around the time of World War II, before the fully fledged IP model had been developed. His later work, and that of his followers speaks directly to IP modelling.

directly from the environment. Gibson's framework emphasises the complementarity of the animal and its environmental niche - hence the name "ecological" - which are seen as reciprocals of each other, fitted to each other by evolution. The organism is thought of as an active system specifically adapted to pick up the invariants in its environment which specify the affordances relevant to its survival and well-being in a direct (unmediated) way.

This emphasis on the inappropriacy of observer-relative descriptions to perceptual theory has something in common with the view I am presenting in this thesis. However, as in the case of PDP already discussed, the DP approach goes only part of the way towards addressing the problems I see as central to the IP model.

It will perhaps be apparent that Gibson's major concerns were animals' perception and visual perception, rather than human auditory linguistic perception. He does, however, make various statements about specifically human perception, including speech perception, and also his work has been extended by various of his followers to cover this area. It is from this extension that the inadequacy of the account of human speech perception arise, I believe.

Language is seen in DP as an extension of human perceptual abilities over and above those of animals, allowing us to perceive at second hand, as it were. If one person tells another about something, it is, to Gibson, as if the first had personally perceived it - except there is no opportunity of reality-testing. This gives humans an important evolutionary advantage, and allows education and the transmission of culture. For Gibson, then, linguistic ability simply sits as an additional layer on top, as it were, of the perceptual and other abilities that we share with the animals. So that while children learn more with language than they would without, it is more of the same kind of thing; and culture is transmitted from one generation to the next, in the sense that each generation is saved the necessity of repeating some of the work of the previous ones, allowing cultural progress. This amounts to a rather naive version of the representational view of language, with its sound-meaning-thought trichotomy that I criticised above.

This view also, like PDP, is foundational in the sense that I have been using the word - although in this case the foundation chosen is rather different: the animal-environment unity, rather than the nature of the brain. It is necessary in this account to assume that there is a definite and particular meaning associated with things in the world:

> "The ecological approach is based on the fundamental belief that man is indeed the mirror of nature." (Shaw and Bransford 1977:6)
>
> "...humans do not perceive chairs, pencils, and doughnuts; they perceive places to sit, objects with which to write, and things to eat." (Michaels and Carello, 1981:42).
>
> [A stone] can be a paperweight, a bookend, a hammer or a pendulum bob...If you know...what it can be used for, you can call it what you please." (Gibson 1979:134).

Such a foundation may be relevant for some kinds of perception, such as animal

perception[40], but the argument of this thesis suggests strongly that it is not appropriate for human cognition like speech perception[41], where the emphasis should be on the process by which Things can be constituted as Objects - requiring an understanding of human Subjectivity such as that outlined in this chapter.

The difference between DP and the present view can perhaps be clearly seen by the following comparison. Consider first a cognitivist definition:

> Surely we all agree that anything that has all the relevant causal powers of food - it saves one from starving, sustains growth and repair, tastes good, etc - *is* food." (Dennett in Dennett and Searle 1982:56, his emphasis)

Gibson, by contrast, recognises (1966:19) that "food" is a relative term: for any animal, food is what it can eat. My position, while acknowledging the improvement of Gibson's view over Dennett's, insists that it is necessary to go considerably further to differentiate between animals and human Subjects. In human language, we can certainly mean more by even a literal use of the word "food" than "something I can eat", which is what Gibson's view would limit it to.

One final comparison can round off this section: In my view, in considering human cognition, and especially in the domain of speech perception research, it is not our sensory end-organs which mediate between the World and the organism (Sanders 1977), but rather our interpretive ability as Subjects that is seen as making the most appropriate local foundation for this domain.

4.7. Conclusion

I hope to have shown in this chapter that accounts of human cognition characteristic of cognitivism are underlain by a particular understanding of the nature of the Subject and of the World, and further to have argued that this view of Subject and World is inappropriate to a domain hoping to understand human cognition. I believe many problems in cognitive science can be traced to this inappropriacy - but I will not argue this as a general point, since this thesis is about human speech perception research, not about cognitive science. In the next chapter, I will show in some detail how some key problems with the IP model of speech perception, founded on the cognitive science tenets, can be traced to the cognitivist understanding of Subject and World. This will lead to the suggestion that making changes in the assumptions at that level would be a fruitful way to seek a genuine alternative to IP.

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[40]Though it should be noted that at least some DP theorists would reject this limitation of the scope of their domain: "... we must reject any suggestion that direct perception might account for certain lower-order perceptual abilities while a mediational theory is required to explain fancy perceptual abilities such as those entailed in speech perception and reading." (Michaels and Carello 1981:164), though as answer to the question (posed by themselves): "How can the ecological approach account for experiential dimensions of hedonic tone (humor, pleasure, amusement) that appear to have no stimulus referents?" they can provide only: "The invariants must be very high order indeed" (1981:178). Verbrugge (1985), on the other hand, seems very open to the problems posed for DP by human linguistic and cultural dimensions, and is working on developing Gibson's views to take account of these issues, in an approach based on the work of Humboldt and Pearce - so again developments should be awaited before judgment can really be passed.

[41]I will discuss this more specifically in the following chapter.

Chapter 5

TOWARDS A NEW FRAMEWORK

5.1. Introduction

The discussion of the last three chapters has been conducted on a fairly philosophical plane, as I have uncovered the understanding of Subject and World which supports cognitivist philosophy and thus the IP theory of human speech perception, and presented reasons to suggest that this understanding is not the most appropriate in the context. It remains then to relate this discussion to the specific domain of human speech perception research and theory; and it is the purpose of this final chapter to make that relationship. The chapter has two main aims. The first is to present a brief analysis of the IP model of speech perception in terms of the philosophical position outlined in Chapter 4. This will allow me to highlight what I see as ill-formulation of the questions IP seeks to answer, and to show how these and other problems with IP can be traced to certain incoherences in its basic assumptions about the nature of the Subject and the World. The second aim is to present a preliminary outline of an alternative framework within which available knowledge about human speech perception can be interpreted, and according to which further speech perception research might be conducted. This approach takes as its starting point a quite different understanding of the Subject and World to that of IP.

5.2. IP Reconsidered

5.2.1. Introduction

At the end of Chapter 1, I discussed briefly the status of the IP model in the eyes of the speech perception community, showing that some conceptual problems are acknowledged, and an increasing amount of metatheoretical research is being done, to rationalise terminology, make explicit - and in some cases, change - assumptions, and so on. I also stated, as motivation for the analysis carried out in this thesis, my own view that the problems faced by IP are actually more serious than is generally acknowledged in the field,

and that this state of affairs suggests a need for deeper metatheoretical analysis than is usually given to the IP theory. I therefore turned to consideration of the (cognitivist) philosophical views according to which the IP framework is justified. Based on the discussion of these views, it is now possible to say what kind of metatheoretical analysis IP stands in need of. One of the consequences of the view of the constitution of Objects by Subjects I have been developing over the preceding chapters, is that scientific theories are seen as relations between Objects, which are themselves products of a relationship between a Subjective point of view and an aspect of the World in a context. This understanding of the relativity of Objects to a domain and point of view emphasises the importance for the coherence of a framework of its Objects and their relationships being constituted from commensurable perspectives. One way of uncovering incoherences in a theory is to analysise the constitution of the theoretical Objects and their relationships.

In this first section of Chapter 5, then, I would like to look more closely at the rationale behind the proposal of the IP model as an account of speech perception. I hope to show that it relies on the bringing together of Objects of different ontological status, constituted in different domains; and the relating of these Objects according to a point of view which is not, in my opinion, appropriate for understanding speech perception. I will do this by reviewing the rationale behind the IP approach, as given in Chapter 1, but this time stepping more slowly and considering each of the points in the light of the perspective that has been developed over the last three chapters.

5.2.2. Motivating Considerations

It will be recalled that IP takes as its starting point, both theoretically and historically, the observation that, despite expectations to the contrary, there are no segments corresponding to phonemes[1] clearly discernible in an acoustic representation of speech.

Introductions to IP often begin by outlining a plausible but false idea of the mechanism by which speech perception is achieved: one in which the individual segments of speech are recognised one by one, to be concatenated into short sequences which can be matched with forms stored in the hearer's memory, and associated with the meanings stored with them. A view very like this was in fact the account of speech perception associated with the structuralist/behaviourist conception of language and language users[2], in which communication was seen as a transfer of a message by the medium of a string of phonemes; and speech perception was understood to involve recognising the phonemes,

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[1]Of course, the significant fact is that there are no segments corresponding to linguistic units of any kind clearly discernible in the speech wave. Historically it was phonemes which were first expected to be found and whose absence was seen as significant. For convenience, I will use the word "phoneme" here to refer to "phonemes or other linguistic units".

[2]For an account of structuralist linguistics and behaviourist psychology, see for example: Bloomfield 1926, 1933; Hockett 1955, 1970; Fry 1974; Anderson 1985; Waterman 1963; Boring Langfeld and Weld 1948; Stevens 1951; Leahey 1980; Wann 1970.

concatenating them into word-units, and associating these with a meaning stored in the memory. This was not a theory arising from research specifically concerned with speech perception. Rather it was an assumption grounded in the understanding of linguistics and psychology of the time, which was in fact used as a premise in certain kinds of theorising[3]. It is this account of speech perception which predicts that the speech wave should be composed of a series of phoneme-like elements, much as writing consists of individual letters. Since speech perception as such was not a focus of particular interest in either linguistics or pscyhology before World War II, the assumption was not much challenged within these disciplines.

It was mainly after the War that the significance of counterevidence was widely accepted (Joos 1948, Liberman 1957). Work at Haskins laboratories, especially spectrographic speech analysis, convinced many that if phonemes were not evident in the speech wave, the assumptions regarding speech perception would have to be modified. It is interesting to note the level at which this modification of assumptions took place. The challenge was not to the idea that communication involved the sending of a message from one mind to another[4], or perception involved matching and association; but to the idea that achieving matchable forms from speech was a simple matter of recognition. It was this last assumption that was modified.

The suggestion was made that the phonemes, rather than being transmitted directly, were *coded* by the speaker for transmission to the hearer. This idea was derived from work in communications engineering, a field which had been very active in studying the acoustic features of the voice and the characteristics of hearing and psychoacoustics, in order to gain the knowledge necessary to transmit speech intelligibly and efficiently along telecommunications channels (Fletcher 1929/1953, Pierce and David 1958, Miller 1951). A major breakthrough had been the demonstration that the efficiency of transmission of messages along limited bandwidth channels was greatly increased if the message was coded in some way (*eg* Dudley 1939). Use of a code meant that less information needed to be transmitted, since the sender could rely on the availability at the receiving end of the knowledge necessary to decode or reconstruct the original message. This idea became the basis of information theory (Shannon and Weaver 1949, Hockett 1953), a powerful mathematical tool for quantifying and optimising efficiency of mechanical communication, which has been extremely influential in many fields (Campbell 1982). Several important concepts of information theory have become widely accepted. One major theme is the

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[3]For example, the assumption that perception must work in some way similar to that just outlined was given as a reason for the structuralist methodological constraint of "no level mixing" (Anderson 1985:285). This assumption was also the basis of the design of early reading machines (Cooper 1950, 1983; Liberman 1984).

[4]The strict behaviourist view did not allow the "mind" as a theoretical term, and the definition of communication was modified to exclude it: communication was thought of as verbal stimulus of one organism by another rather than transfer of a message from one mind to another (see Bloomfield 1933:26). This alternative formulation can be seen as a brief interlude in the historical development of speech perception theory, and is not especially significant in the present context.

conceptualisation of *information* received as reduction of uncertainty in choosing among a number of possible message elements. Another is the idea that efficient communication could be defined as sending only essential, *ie* non-reconstructible, information. The now well-known notions of "channel", "signal", "noise" and "redundancy" also stem from this work.

These ideas about communication were a source of inspiration to early speech perception researchers. When it became known that phonemes were not readily apparent in speech, it seemed likely that they had undergone an analogous coding process, perhaps evolved to improve the efficiency of speech communication. This idea resulted in an embellishment of the original structuralist/behaviourist view: communication was now seen as *coded* message transfer; speech perception as *decoding*, concatenating, matching and association with meaning. Thus in verbal communication the speaker was sending not a message, but a "recipe" for making or reconstructing a message (Cooper 1980). Of course, speech was far from being a maximally efficient recipe. This was explained as necessitated by the noisy channel that has to be used: a degree of redundancy was built in to the system to counteract the noise by coding the same information in different ways. This could help explain, it was argued, the "robustness" of the speech signal: considerable portions are predictable and can be lost with little harm to intelligibility.

This view proved very productive in defining a research programme for speech perception research over the next decade (Rubenstein and Aborn 1960, Diebold 1965, Fischer-Jørgensen 1958, Fry 1974, Lehiste 1967). Much work was done, using synthesis and spectrographic analysis, to identify information-bearing cues in speech that the hearer could use in reconstruction of the speaker's message. There was also considerable research into the statistical properties of language, since knowledge of the frequency of occurrence of sounds and sound sequences was thought to be an important aid in perception - based on the idea, described above, that receiving a message involved selection from a known inventory of possible elements.

However, several problems for speech perception theory emerged from this work. It turned out that cues and segments were not found in any very clear relationship. The extent and unpredictability of coarticulatory processes meant that the effects of context, both acoustic and linguistic, were very strong. It seemed that hearers made use of more than statistical knowledge about language. They could apparently use syntactic and semantic knowledge as well, though there was at the time no clear idea of how to account for this ability.

It was as a solution to these problems that the mechanism of information processing was seen as a great breakthrough in psycholinguistics. Around this time the new discipline of cognitive science was being born[5]. The central concept of cognitive science was that

[5]The philosphical background to cognitive science has been discussed at length in Chapter 2. For more historical surveys and interpretations, see Machlup and Mansfield 1983, Gardner 1985, Baars 1986, Hirst 1988, McCorduck 1979, Weizenbaum 1976/84, Dreyfus 1972/79.

cognition could be thought of on the analogy of computation. This provided, as was seen in detail in Chapter 2, a mechanism whereby knowledge, goals, plans, etc, could be used in psychological processing. Clearly this was extremely relevant to the problems faced by speech perception theorists. Computation is the heart of the basic information-processing model that has underlain almost all work on speech perception since about 1960 - as described in detail in Chapter 1.

This brief consideration of the motivation for the IP model highlights several remarkable points, from the perspective of the present argument, some of which will be commented on in following sections. At this stage, I would like to note that the issue that has been all along the key to the understanding of speech perception is that of the *description of the speech signal*. In the first stage, the signal was described in linguistic terms; later it was described in acoustic terms; currently there is considerable debate over the question of whether the description should be acoustic, articulatory or auditory, or should focus on static or changing features, and so on.

The discussion of the last three chapters has had a great deal to say about the notion of description, directed towards the conclusion that any description involves the point of view of a Subject in a situation, and that deciding upon the most appropriate description of a Thing in a domain requires consideration of the point of view of the Subject for whom it is Object. In the development of IP, however, it is nearer the truth to say that the characteristics of the Subject in the theory have been determined by the description of the signal. From which Subjective point of view then is the IP signal-description constituted? The answer, I believe, is: that of the researcher, the Observer. Of course an implicit understanding of the nature, abilities and needs of the Subject has been influential. This understanding is seen in operation in the drawing of analogies between human communication and message transfer, or between human perception and computation. It is also crucial in motivating a description of speech in terms of invariant relations between acoustic features and formal linguistic segments. In the next sections, I hope to show that, first, IP pays insufficient attention to the distinction between the point of view of the Observer and that of the Subject of the theory; and second, that the understanding it has of the nature of the Subject is inappropriate.

5.2.3. The Subject's Task

In this section, I would like to consider in more detail the understanding IP has of the task that the Subject faces in understanding speech. It has been seen that it is thought of as essentially a process of transforming sound into meaning. Crudely stated, IP's position is that the hearer's goal is the speaker's meaning but what enters the ear is the speechwave: it is therefore necessary to convert one into the other. This conversion is supposed to be achieved by *matching* the incoming form against a form stored in memory with a meaning attached to it.

Before considering this statement of the task of perception further, it is worth noting that it is, as it stands, entirely suitable as a description of the task in any of the accounts that have been considered, whether structuralist/behaviourist, coding or IP (or, indeed, as I will show below, the alternatives to IP mentioned in Chapter 1). Each of them sees speech perception as a conversion of sound to meaning achieved by matching; the differences revolve around the issue of how the matchable form is attained. Though the introduction of the computational view of cognition was "revolutionary" in many respects, as far as the basic understanding of the nature of communication and perception were concerned, it involved little change. It is the relative complexity of that process that makes the Subject in IP more "active" than that of structuralism/behaviourism. The basic task is *exactly the same* in the two accounts - conversion of sound to meaning by matching.

Consider then the postulated method of achieving this transformation of sound to meaning - matching - in the light of the position reached in the last chapter. Matching implies designating two things as "same", which can only be done, I have argued, from the point of view of a Subject who understands the purposes and criteria of similarity. To designate the forms of words as "the same" it is necessary to understand the context and criteria of the designation - which in this case involves understanding the meaning of the words being compared. But this is of course precisely what the theory that includes the matching process is purporting to explain: how Subjects come to understand the meanings of words. This is why I claim IP is a theory which invokes a homunculus. The problem here can be seen to be an instance of confusion of point of view of Observer (for whom the two Objects are already constituted and named, and are "obviously" "the same") and that of the Subject, who is necessarily in the process of constituting Objects as what they are in the context.

Next, consider the task that this matching is proposed to achieve: conversion of sound to meaning. Again the argument of the preceding chapters has had a good deal to say about this. "The sound" and "the meaning" are not *given* as the two component parts of speech. They must be (like everything else) constituted as Objects by a Subject; which means (in this case) that they must be abstracted on the basis of an understanding of speech as a Whole greater than the sum of these two parts, since "sound" here is a physical description of the Thing "speech"; and "meaning" is a semantic description of the Thing "speech". The Observer can make the relevant kind of abstraction and constitute these Objects; but they should not be attributed as ready-made Objects *for the Subject* - to do this is to forget the role of the Observer in their constitution, and thus inevitably to invoke a homunculus to explain their existence-as Objects for the Subject.

In fact, though, IP claims more than that "sound" and "meaning" are separate Objects to the Subject. It presupposes that the description of speech *as sound* is more "concrete" or "neutral" than a description as (abstract) meaning - as seen by the account of speech perception as conversion *of* sound *into* meaning. But of course, it has been shown that any description is abstract with respect to the Thing described. Ranking the descriptions involves an Observer with values to provide the criteria of ranking. I will return to this point below.

5.2.4. A Mechanism for the Task

It is, I have argued, as a mechanism for achieving the sub-goal of providing matchable forms that the computational analogy was considered highly attractive. Though I have now, I hope, cast doubt on the validity of the IP formulation of the task of perception, it is worth considering the mechanism by which it was to be accomplished for the insight it can provide into IP's understanding of the nature of the human Subject. Though, as I have argued, IP has been more concerned with the nature of the speech signal than of the Subject, it is clear that its description of speech rests on an idea of the Subject as a perceptual system for which certain things are possible or impossible, simple or complex, and so on. As I will show in this section, IP has been mainly concerned with *constraints* the Subject is thought to operate within.

First, the Subject is presumed to be able to operate only with material entities. Recall, however, what this means in the "monist" philosophy that supports IP: that the Subject can operate only with physically *described* entities. We have just seen how this constraint influenced the formulation of the task of perception: since "sound" (*ie* description in acoustic/physical terms) is "more material" than "meaning" (*ie* description in non-physical terms) it must be that sound is converted into meaning. Second, the Subject is presumed to be able to operate only according to formal rules, which, though abstract, are still allowed in the monist ontology. It has been shown that it was as a mechanism which operated on these principles, but could nevertheless achieve complex, "intelligent" behaviour, that computation was so attractive.

These two constraints allow two kinds of processing. It will be recalled that IP's computation is seen as a combination of **bottom-up** and **top-down** guided transformations. How plausible are top-down and bottom-up processing as kinds of processing that human Subjects perform?

Bottom-up processing, it will be recalled, is simple "recognition" of what is "there". Already in this statement, however, the central problem of bottom-up processing is evident. The antifoundationalist argument of Chapter 4 concluded that Things do not simply announce themselves as what they are. They must be interpreted as what they are by a Subject in a context. This is just as true, as has been seen, of "low-level" as of "high-level" Objects. IP however depends crucially on the understanding that the results of the kinds of descriptions and abstractions *done by linguists* give the definition of the sounds that is most basic or low-level *for the Subject.*

The question that must be asked in thinking about speech perception is "As what kinds of Objects are the Things we call speech sounds initially constituted *by the perceiving Subject?".* The argument of the preceding chapters has made the point very forcibly that the answer must be "As something that is meaningful to the Subject in the situation". There is no way for features, phonemes, syllables, or any of the other formal unit to emerge as

meaningful Objects *except* to a Subject with an understanding of the Whole of speech. Speech is not a compound of such "bits"; the features, allophones and so on are abstracted from the Whole, which incorporates the aspect that can be Objectified as the "meaning". Most importantly, analysis into these kinds of Objects depends on the Subject's understanding of meaningful speech, as well as the point of view of an analyst with certain values, criteria and purposes. This is the reason that such formal units do not easily fall into neat, regular patterns. Of course, linguists can attempt to make the patterns more regular, by further abstraction and idealisation. But from the perspective of the present train of argument, this is exactly the wrong way to go about clarifying what these relationships are *for the Subject*. In the process of this kind of tidying up, the Objects become more and more abstract, and the point of view of the *researcher* (as opposed to the perceiving Subject) more and more part of their constitution. Units thus produced are, from the Subject's point of view, high-level, not low-level units.

I should make clear that demonstration of the existence or otherwise of so-called "physiological feature detectors" makes no difference to this argument. If they do exist, what they "detect" is not "features" in any linguistic sense. They respond to some *uninterpreted* features of the World: it is the Subject as a Whole which interprets such features as meaningful sounds. If "feature detectors" - *ie* cells or cell-groups which respond to stimuli that we as linguists can equate with linguistic units - are found to exist, that would be extremely interesting and useful. Even if they are not, though, there must still be some such physiological "substrate" to speech perception. Whatever its nature, it should not be described - in any context purporting to describe the Subject's point of view - as resulting in "output" of any linguistically-described forms.

It is worth pointing out here a problem to which the IP account of bottom-up processing is prone, even in its own terms - that of **normalisation**. If bottom-up processing were to work, it would require the cancelling out of many non-significant differences among speech sounds, and the focussing on some significant "same" features. This problem is addressed to some extent by IP researchers (see Chapter 1), but in general it is left aside as a task to be addressed sometime in the future. The fact that humans somehow do manage to normalise over the many different voices and dialects that they understand makes it seem, in IP terms, that it must be a problem with a solution, hard as it might be to determine what that solution is[6]. From the point of view developing here, though, such a sanguine attitude is not warranted: the difficulty of normalisation is a symptom of the deep problems with IP's conception of the process of perception. The source of the problem is evident in the use of the terms "significant" and "same". The Subject would need to be able to compare Whole words to discover which aspects of them are the same across many different productions.

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[6]The situation is of course very different in automatic speech recognition, where the issue of normalisation has to be faced as a matter of priority. It is a big enough problem to have prevented, so far, the development of large-scale multiple-user systems.

To summarise the argument of this section - There may well be a sense in which the Subject goes through "stages" of "processing" in understanding speech. But the "lowest" stages will not involve the processing of "meaningless" phonological units. It could not be so: there can be no Objects for a Subject that are not meaningful to that Subject. Phonological units are certainly meaningful to the linguists who constitute them *as* (linguistically) meaningless, low-level units. But they can be constituted as such only on the basis of an understanding of the meaningful Whole. The confusion arises from the assumption that once constituted as "low-level" by linguists, such Objects must also be low-level for the Subject.

The second general kind of computation in IP models - **top-down processing** - is invoked when there is not enough information in the representation itself for the Subject to identify it as what it is, thus requiring the use of knowledge to help in the identification. It is significant that IP models (with a few modern exceptions, mentioned in Chapter 1), invoke top-down processes only when it becomes clear that bottom-up recognition is impossible: "recognition" in this sense is universally considered "simpler" for the Subject. The differences of opinion are around the question of the extent to which the signal allows such recognition. The ability to incorporate some kind of "top-down" processing when necessary is what distinguishes IP models from previous accounts of speech perception.

Once more, there is a problem here caused by confusion of the Observer's and Subject's points of view. Information is necessarily information-to (some Subject). What the IP phrase really means is that there is not enough information-to the Subject of IP theory in an IP Observer's description of speech for the IP Subject to identify the IP Observer's description of the matchable (canonical) form. This confusion is responsible for the fact that (some of) the knowledge invoked in an IP model is the knowledge that would be needed for the Subject to convert one of these descriptions of speech into another. But, from the point of view of the Subject, both of these descriptions are quite arbitrarily defined. Thus the knowledge that is needed to convert one into the other will also be relative to the Observer, rather than the Subject.

A second problem is that the way in which knowledge application and other top-down processes are said to operate is quite different from the way human Subjects, as seen in this thesis, understand their world. In IP, a Subject's knowledge has to be formulated as an explicit representation to allow it to interact according to formal computational rules with other representations of other information from other sources, also formalised and represented. Previous chapters have discussed at length major problems associated with representing information, interpreting representations, and defining and applying rules. It is interesting, then, to consider *why* IP sees the Subject's knowledge in this way. The reason is entirely the constraint that the Subject should operate only with physically and formally defined entities, as required by the principle of monism - in short, that the Subject should be a formal system. But of course, in the present perspective, human Subjects operate under no such constraint. In fact, I have argued that the human Subject could not be a formal system: no formal system could exist as a Subject.

5.2.5. Conclusion

The discussion so far has pointed out several kinds of problems with the metatheoretical justification for an IP model of human speech perception. After the philosophical work done in Chapters 2, 3 and 4, it is possible to suggest a diagnosis of what causes these problems in terms of the model's underlying understanding of Subject and World.

With respect to the nature of the World, IP takes insufficient account of the distinction between Thing and Object, and the process by which Objects are constituted. Firstly, the model depends upon the assumption that (some) Objects exist already-consituted as what they are for the Subject of the theory, to be "recognised" by the perceptual system. But the Objects of the theory are Objects which could only be constituted by a Subject which understood speech as a Whole - hence my criticism that IP confuses the perspectives of Subject and Observer. Secondly, the lack of attention to the distinction between Thing and Object means that no account is given of how the Subject could constitute linguistic Objects from Things it experiences.

With respect to the Subject, since the Subject of IP is seen (erroneously) as needing only to convert or transform one Object into another Object, rather than constituting Objects it can be understood as a formal system operating with computational rules. Much argument has been devoted here however to showing that no formal system could achieve the constitution of Objects from Things - which is the task the Subject really faces in a World where Objects do not already exist-as what they are.

All the Objects of IP depend for their existence on abstraction and idealisation by a Subject who understands speech as a Whole: the canonical form of lexical items; the "message meaning" and especially the other possible meanings from which the "correct" message must be disambiguated; all the sublexical units and the cues which identify them; the phonological, phonotactic, and frequency rules that are applied in the course of processing[7]. Speech for the Subject *must* be more than the sum of all these Objects (for reasons explained in the preceding chapter); it must be a Whole from which all these, and infinitely more, can be abstracted. It is this Whole which is meaningful to the Subject. Perception of a "message" is not (could not be) integration of all these kinds of Objects; it is abstraction (Objectification) from the Whole Thing. I will return to these points in the remainder of this chapter.

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[7]Cutler (1981) makes, very entertainingly, the serious point that such rules depend on abstraction from actual occurrences.

5.3. Effects of IP Framework on IP theory

5.3.1. Introduction

My disagreement with the IP model, I have just argued, turns on a disagreement with its underlying assumptions about the nature of the perceiving Subject, which in turn depend upon assumptions about the nature of the task the Subject needs to perform in order to perceive speech.

In the next section I would like to review briefly some of the main areas of debate within IP, as discussed in Chapter 1. Though there is considerable sophisticated argument in IP around these issues, the level of assumptions that I have been addressing here is little mentioned. The understanding of the task of speech perception is stated as a ground from which further argument is developed. It is not considered and defended in terms of the nature of the human Subject. Rather it is used as the basis for stating the nature of the Subject.

5.3.2. Invariance and Segmentation

It will be recalled from Chapter 1 that one of the key issues in IP research has been to discover the extent to which the speech wave contains invariant cues to any linguistic units. There is, as was described in Chapter 1, currently considerable disagreement as to whether speech does in fact contain invariants of this kind, and if so, what form they take.

Although the reasons for taking one or other of these views are usually clearly stated, there is little explicit discussion of the criteria as such. What is needed here, in my opinion, is an exposition and critique of the rationale behind the search for invariants. Behind the disagreement as to whether there are invariants, there is agreement that *if* there were invariants, perception would be "simpler". The implication is that with more invariants, more of the processing can be bottom-up, and there is a simpler route from signal description to canonical description. This is a case, then, where an idea of the nature of the Subject has influenced the IP understanding of the nature speech.

Following the discussion above, the problems with this rationale are evident: "invariant" is a special case of "same". Both definition and use of invariants requires a background understanding of the Whole; incorporation of a notion of invariants in a theory of perception invokes an unacknowledged homunculus. The problems in specifying invariants then arise from the lack of attention to the fact that they are derived from Whole speech and a Subjective point of view.

On the other hand, from the perspective I have developed, the Subject does not need there to be formal invariants in the speech wave. What the Subject perceives is meaningful speech; the task the Subject has to achieve is to identify the words and other meaningful

units as Wholes. It is because they are (linguistically) meaningful that they can be perceived as (linguistic) Objects.

Thus the question of whether there are invariant acoustic correlates of linguistic units in speech - while an interesting one with potential usefulness if answered in the affirmative - is really not relevant to the perceiving Subject. Such invariants are high-level abstractions from the Subject's point of view (as seen by the work done to abstract them by researchers). IP theorists incorporate them at low levels of the processing mechanism because of considerations to do with their own philosophical framework.

The other traditional problem of the IP approach, closely related to the first, is that of segmentation of the (quasi-) continuous speech wave into discrete, linguistically relevant units. Again, comments based on the preceding discussion can be brief. Consider the constitution of these Objects, the units of speech. Linguists - using their understanding of speech as a Whole, and their ability as normal speakers to abstract from it "sounds" and "meanings" - abstract and idealise systems of sound-segments of different sizes. There is no reason, from this point of view, to think that an acoustic record of speech sounds should show clearly distinguished linguistic units. Speech is not made up of a sequence of concatenated formal units[8]. It is made up of meaningful units, and the formal segmentation of sound depends upon the understanding of speech as meaningful. The units into which the perceiving Subject "segments" speech initially are, and can only be, meaningful units - *eg* words, with their sound aspect and their meaning aspect. There is no particular reason why there should be a neat segmentation in the sound aspect alone - and if there were it would not be of any particular help to the Subject in understanding the speech. In cases where such a segmentation is possible, it is purely fortuitous, from the Subject's point of view. Both the segments and the (invariant) cues to the segments are Objects constituted by a Subject who understands the Whole of speech - *ie* the Observer.

5.3.3. Model Architecture

Several issues of model architecture were discussed in Chapter 1, notably the problem of the number of modules or stages of processing, and the problem of the degree to which modules should be able to interact.

From the present perspective, the modules are more closely related to descriptions linguists can make of speech, than to descriptions that are relevant to the Subject in the course of perceiving speech. This is related to the long tradition in speech perception research of considering the "speech chain" as a series of transformations of a message (Joos 1948,

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[8]Modern non-linear phonology makes the same point very strongly, although from a quite different perspective. (Linell 1982 discusses the relationship of psycholinguistics and phonology very clearly and insightfully.) These hierarchical accounts however are still attempts at a formal segmentation of speech as sound-only, without including its meaningfulness. As such, valuable as they may be in their own right, from the present perspective, their applicability in a theory of speech perception from the Subject's point of view is highly problematic.

Fischer-Jørgensen 1958, Lehiste 1972). Of course, here too the IP community shows considerable sophistication in considering which of these descriptions should be incorporated into a model of perception (see Chapter 1). But again, in my opinion, it is necessary not to argue for one or other model, but to discuss the criteria according to which a model should be chosen.

The result of the change from the structuralist/behaviourist view of perception to the coding view was that where there had been two parts to speech - sound and meaning, there were now three - sound (acoustic description), form (phonological description) and meaning (semantic description). In developing this view, IP has generally increased the number of intermediate levels. Each suggested configuration of modules is proposed as a set of landing stages in the process of transforming "sound" into "meaning". But I have argued above that each of these levels is equally abstract to the Subject, and each depends for its existence as an Object on an understanding by the Subject of the Whole of speech. It is according to the *linguist's* values that the descriptions are arranged in the order they appear in the models: ranked according to the size and "concreteness" of their units. The problem of specifying the relationship between the levels has been discussed since the early days (Fischer-Jørgensen 1958). Again, from the present perspective, there is no more reason to expect a neat relationship between intermediate levels than between "sound" and "meaning". Postulating intermediate levels does not help solve the problem; it merely shifts its focus, and perhaps helps disguise the real difficulty with *any* IP formulation, which is exactly the same as the difficulty with the structuralist/behaviourist formulation - the idea that perception consists in converting sound into meaning.

Of course, as was seen in Chapter 1, some IP researchers themselves question the relevance of various particular levels, or even of the notion of multiple intermediate levels at all. The arguments they use are cogent in themselves, but again they do not strike at the root of the problem. For example, to propose a lexicon with precompiled phonological information certainly decreases the amount of computation needed - no doubt useful in an automatic speech recognition device. But its difficulty is shown by the very term "precompiled": the problem of the homunculus is only shifted to a different level, not solved.

One of the major issues, as was also seen in Chapter 1, is that of the interaction of modules, and the flow of information. From the present perspective, this can be seen as the attempt to cope with the problems caused by the formulation and constraints of the task, rather than as reflecting a significant phenomenon of human speech perception as such. The same is true of the interaction of speech perception processes with other related cognitive processes. Any IP model attempting to allow the kind of fluidity and flexibility apparently characteristic of

human perceptual skills[9] is faced with the major problem of control[10]. A "control module", admitted or implied, is simply another word for a homunculus, and the need for such an entity is a symptom of the inappropriacy of the Subject postulated by IP.

5.4. Comparison with Existing Alternative Frameworks

It will be recalled that two alternative frameworks for the study of speech perception have been attracting an increasing amount of attention recently - Gibsonian Direct Perception and Parallel Distributed Processing, or Connectionism. I have already outlined the main features of these approaches (Chapter 1) and commented on their philosophical frameworks in comparison with the one I recommend in this thesis (Chapter 4). Here I would like very briefly to make explicit why, in my opinion, they do not overcome the problems I have raised above for IP. In short, my argument will be that while they do present good arguments against some aspects of IP, they do not address what I see as its most salient difficulties, as uncovered above, and therefore in the end do not offer significantly different alternatives.

I can deal first briefly with Parallel Distributed Processing, and the TRACE model discussed in Chapters 1 and 4. Although this alternative deals well with one of the kinds of problem IP suffers from - the kind caused by the view of perception as serial, symbolic processing involving application of explicitly represented knowledge - it does not change the fundamental understanding of speech perception at the level of assumptions about Subject and World. The task of perception is still seen as the matching of sound with meaning; the approach still confuses Objects constituted by an Observer with Objects that exist for the Subject, and keeps the same (inappropriate) criteria of concrete/abstract as IP.

Turning to Gibsonian Direct Perception - this, too, is successful in focussing on a serious problem with the IP account - the confusion of the perspective of the Subject with that of the Observer involved in assuming that the speech signal exists as a physically-described Object for the Subject. However, in my opinion, the solution offered by the DP alternative does not reach to the core of the problem. The main difficulty that it still faces is that of *meaning*. It will be recalled that DP proposes that in perceiving speech the Subject is perceiving not an *acoustically* defined Object, but the articulatory gestures which caused the acoustic signal. By this redefinition of the task, DP hopes to overcome problems of variability and the consequent need for computational processing to achieve a canonical form.

The issue DP does not address is the distinction between Thing and Object, and the need to

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[9]Especially clear for example in Bannert (1987:74), in whose model "All information of a linguistic and pragmatic kind may be used by the various stages and processes of speech recognition at all times and wherever necessary and useful. A close and optimal acting together of bottom-up and top-down information even at low levels where the first linguistic interpretation of auditive-acoustic information occurs and non-linguistic short cuts by-passing all the hierarchically structured acoustic and linguistic levels, are assumed for speech recognition."

[10]This too is a difficulty ASR modellers are forced to confront.

account for the Subject's constitution of Objects from Things. DP still sees the Subject's task as the matching of one Object with another - a sequence of articulatory gestures with a meaning. But how could "articulatory gestures" emerge as Objects for a Subject? Of what "ecological significance" are articulatory gestures to the Subject[11]? How is the "meaning" of speech constituted as a separate Object to the articulation? How is the process of matching the articulation and the meaning achieved? All of these processes require a Subject who understands speech as a Whole - *ie* the Observer.

These difficulties are related, I believe, to the inadequacy of the Gibsonian understanding of human Subjectivity and language. It was seen in Chapter 4 that for Gibson, speech perception is a two-stage process: first the shape of the words is directly perceived, and then the meaning is recognised. This must be so, he says, because, whereas the connection between a stimulus and its source is necessary, lawful and specific, that between a word and its meaning is arbitrary and conventional.

> "The pick-up of sounds, including speech sounds, is a one-stage process. The apprehension of things referred to, however, is a two-stage process, since it involves both the discrimination of the vocal articulators and the learning of what they stand for. The acoustic sounds of speech specify the consonants, vowels, syllables and words of speech; the parts of speech in turn specify something else." (Gibson 1966:91).

Thus, I believe, DP keeps the crucial aspect of the IP (and behaviourist) conception of speech perception, and for this reason, is subject to analogous problems. Questions arise for the approach as to how the two stages (recognition and matching) interact: how much of the first stage is completed before the results are passed on to the second? In what ways can considerations from the second stage influence the operation of the first? For example, when Gibson states that in cases where there is incomplete information, the system hunts for more, he implies that the system somehow know what it is hunting for - *ie* must have some understanding of the meanings in the situation. But in the case of speech, according to Gibson, the meaning is only given as a second stage. Since these are precisely the problems that led to the elaboration of the IP theory into its modern form (as shown in chapter 1), it would seem that if Gibsonian theory is to come to grips with these questions, while still maintaining the two-stage model, it will develop along very much the same lines as IP has. Consider for example Gibson's remark:

> "If invariants still do not appear [after hunting], a whole repertory of poorly understood processes variously called assumptions, inferences and guesses come into play". (Gibson 1966:303-4)

This suggests that the simplicity of the Gibsonian model of speech perception compared to the IP model, is due not to its superior conceptualisation of the phenomenon, but rather to its ignoring of the problems that arise within a basically similar conceptualisation. Some of the IP criticisms that DP fails to account for errors and context-dependency in speech perception would thus seem to be justified - though missing what I see in this thesis as the crucial failing of the approach.

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[11]Diehl (1986) makes a similar point.

There is one further possible alternative to an IP theory of speech perception that should perhaps be considered here - that of phenomenological psychology, a healthy field of psychological study based on some of the phenomenological principles outlined in Chapter 3 (see for example, Valle and King 1978; Giorgi 1970, 1976; Bolton 1979). In general, this approach seems to be preferred for clinical and social psychology, though certainly theoretical work is done. I think it is fair to say that cognitivist styles of psychology are not as a rule held in high regard among phenomenological psychologists. To my knowledge, very little research in this field has been concerned with the issue of speech perception as meant here (though much work has been done on perception more generally); certainly there is little appreciation of the more technical aspects of speech perception research in linguistics (*eg* Hollnagel 1978 sees a similarity between analysis-by-synthesis theory and hermeneutic method).

It is difficult then to assess the aptness of this approach for speech perception research. My opinion, however, is that, to the extent that an approach was based on the phenomenology of Husserl (as much phenomenological psychology is) it would be unlikely to overcome the problems I have uncovered with respect to IP, and, for the reasons suggested in Section 3.2.4 is liable in fact to become rather similar to IP. To the extent, on the other hand, that an approach was based on the philosophy of Heidegger (or Merleau-Ponty), I believe it would be necessary to tailor the approach to the particular domain, rather than sedimenting a particular part of his philosophy - again for reasons given in Chapter 3.

5.5. Conclusion

I hope to have shown that the defining problems of the IP approach, which arise (naturally enough) from its conceptual framework, are ill formulations of questions about the process of speech perception from the Subject's point of view. The most serious problems are not those specific to the computational analogy itself, but those relating to the formulation of the problem to which that analogy was seen as the solution. Thus I hope further to have shown the problems with the conceptual framework that underlie these theoretical difficulties. In particular, I have pointed to the incoherence of the (mis)understanding of the nature of the Subject (as a symbol manipulator) and the World (as composed basically of small physically or formally described elements in regular relationships) as the source of problems with IP, both those identified by its own practitioners, and those raised in this thesis.

This understanding unifies IP despite its very real and serious lack of unity with respect to more superficial commitments. In fact, I believe that it is this understanding which in a sense causes the lack of unity, by encouraging formulation of unanswerable questions - a classic case of it being not the answers that are wrong but the questions. There are thus created conceptual difficulties which cannot be solved without considerable analysis of a kind indeed not much encouraged by the IP framework: the means of solving them are denied by the initial tenets.

Significantly, in uncovering the conception of Subject and World which underpin, and undermine, IP, I have shown that it is identical to that of the preceding structuralist/behaviourist understanding of speech perception, which is the view *in opposition to which* IP defines itself. It is possible then to interpret the history of speech perception research as a series of attempts to overcome the inadequacies of this understanding. On this view, the decisive historical moment was the demonstration of the nature of the speech wave, in the 1940s. This could have led to a reappraisal of the understanding of communication and perception which had spawned in the first place the idea that speech might consist of separate phonemes. However, as we have seen, this was not the step that was taken. Rather the attempt was made to patch up the insufficiency of the "recognition and matching" conception with the "decoding, recognition and matching" conception. This in turn was found inadequate and replaced by the early, rather simplistic IP models; which once again are being shown to be inadequate.

Modern work concentrates to an unprecedented extent on conceptual and philosophical issues, but still, as I have argued, no enquiry has reached the level from which the difficulties of all these conceptions stem. IP's arguments *against* the structuralist/behaviourist theory of perception and communication, cogent as they admittedly are, are not in themselves arguments *for* an IP theory. The same remark goes equally for the two alternatives currently challenging IP. As I have argued, though each of them improves over IP in terms of the specific features it tackles, each nevertheless rests on the same basic conceptual underlay, and suffers in the end from problems analogous to those of IP.

However, my analysis has done more than point out a lot of problems with IP speech perception research and trace them to confusions in its conceptual framework; it has also thereby suggested the direction in which it would be most fruitful to look for an alternative.

In a nutshell, I hope to have made clear two major points. First, that a Subject such as that implicit in an IP account of speech perception (*ie* a formal symbol manipulator) *could not* perform the task of perceiving speech as that task is formulated by IP (*ie* computation, matching and access). Second, that a Subject such as a human being is *need not* perform any such task in order to perceive speech.

It was seen how it was the formulation of the task faced by the Subject that made the computational analogy relevant. If the task is described differently - in particular, if the Subject does not need to match forms to access meanings - the computer no longer seems to provide a useful mechanism for achieving it. The problems of invariance and model architecture and the rest - shown to be insoluble because they rest on a confusion of Subject's and researcher's perspectives - do not arise at all. Rather, with a different background understanding of the Subjectivity of both the perceiver and the researcher, a quite different formulation emerges of the task of speech perception, and a quite different empirical framework develops around it.

It is to consideration of the characteristics such an alternative framework might have that I turn in the second half of this chapter.

5.6. Towards a New Framework

5.6.1. Need for Hermeneutic Approach

In Chapter 4, I considered briefly two basic kinds of framework for scientific research - the axiomatic and the hermeneutic, sometimes associated respectively with the natural and the human sciences. In an axiomatic framework, a small number of assumptions, definitions and methodological principles provide a (local) foundation according to which the basic questions of the research programme are formulated. Research within the framework is designed to provide answers to these questions, or sub-questions defined with respect to them, and practictioners agree not to doubt or question the local foundations of the framework in any major way. There is thus derived, over the course of time, an edifice of theory and explanation grounded in the local foundations.

In the hermeneutic method on the other hand, the topic of enquiry and the methods for stating and answering questions are not initially definable in an explicit and generally accepted way. The task of the researchers is to constitute the Objects of the domain, rather than to accept Objects as given by the foundation. It will often be the case that no single set of Objects is adequate to describing the domain. In the hermeneutic approach, mindfulness of the antifoundational nature of the world is more relevant. Researchers want to come to an understanding of an aspect of the Life-world in its pre-Objectified nature, and see their task as its interpretation and explication. It is therefore crucial precisely *not* to accept as given a pre-defined set of assumptions, definitions and methods; but rather to be able to look at Things from different points of view, attempting to see behind and between the categories inevitably involved in any description and Objectification of them. Such a method will not, at least in early stages of development, result in so impressive an edifice of theory as the axiomatic approach. But then that is not its aim. Its aim is explication, which adds detail at the same level rather than moving up to higher levels (resulting in theory like a many-roomed bungalow, as opposed to the sky-scraper of the axiomatic method).

IP, clearly, is a theory of the axiomatic kind. By contrast, I wish to recommend here that the hermeneutic method offers a potentially fruitful approach to development of an alternative, perhaps complementary, framework.

A case could perhaps be made that in any domain which includes Subjects among the Objects it studies the hermeneutic method is preferable. In such domains it is necessary to attain some understanding of the Subject's point of view as distinct from that of the Observer, since the Subject's own understanding influences the structure of the domain. In order to distinguish adequately between these two points of view, it is necessary to come to

an understanding of the pre-Objective Life-world and the points of view of the (observed) Subject and the (Subjective) Observer. Neither of these requirements are easily met by the axiomatic approach.

In any case, whether or not this general point is valid, I think a hermeneutic approach is appropriate in an instance where there is unclarity with respect to which Objects, facts and methods to accept as the local foundation of an axiomatic approach. Accepting any one such set inevitably limits what can be discovered from that foundation (which is precisely its advantage in domains where this approach is successful). However, unless the practitioners of such an approach are very clear about what these limits are, and the effects of imposing them on the research programme, conceptual problems are almost certain to arise. These kinds of problems are then very difficult to overcome within the framework itself. This is the situation I believe IP to be in at the present time; and it is this state of affairs which I consider to be the major reason to suggest a hermeneutic approach for the new framework for speech perception research.

Naturally, given its character, "the hermeneutic method" is not a single well-established, externally imposable set of procedures, but rather a set of general principles whose details must be worked out according to the character of the problems to which the method is applied. What I give here, then, is an adaptation of these principles in the light of my understanding of the problems of speech perception.

I suggest starting with a broad statement of the domain of enquiry - so broad as to be generally acceptable without need for special qualifications and disclaimers. Subdivisions of the domain will emerge readily on further enquiry, according to criteria developed within the framework (compare the alternative of deciding on subdivisions from the outset according to criteria which may turn out later to be inappropriate). This broad starting statement defines literally and wholly what is to be explicated and understood. There is no foundational metaphor or analogy (though surely minor metophors must be used as part of the theory). It may of course prove necessary at a later stage to modify the starting statement, but this can be done with relatively little loss of the understanding gained on its basis (compare the problems that arise if the axioms of an axiomatic theory are modified).

Deciding on the formulation of the broad starting statement is clearly a crucial step in the hermeneutic approach. Such a statement must obviously be chosen and justified according to an understanding of the domain of enquiry; it cannot be defined in a vacuum. Thus it is by no means the first step in setting out a theoretical framework, but rather the culmination of a considerable amount of work: it is the interpretation of the essential characteristic of a domain by a Subject with experience and understanding of the domain, as well as pretheoretical commitments and values, some of which will have been made explicit, debated, defended and refined.

It is from the broad statement that the research begins which will constitute the approach

and theory. The general character of the method has already been foreshadowed: that of explication of questions and observations which arise with respect to the broad statement and the general orientation of researchers with respect to point of view, values and so on. Some of the questions for exploration will already have emerged from the earlier process. Others will arise in the course of explication. The hallmark of the hermeneutic approach is its "circularity"[12] in the sense that there will be frequent change of focus from the details to the broad statement and back again, so that understanding at different levels can influence each other. Conceptual and empirical work are thus very closely connected. All work at the level of detail must always be related to the level of generality, the whole seen in terms of the parts, and vice versa. The "rigour" of this approach resides in the thoroughness with which responsibility for this relationship is undertaken.

Again, though, it is in the nature of this method that there will be no very reliable, detailed, explicit guidelines for how to go ahead with development of the theory. These too must be worked out according to the character of the emerging domain. The role of the judgment of the research community is thus emphasised (as discussed in Chapter 4). Again, though, this should be seen not as a loss in comparison with the axiomatic approach, but as a gain, achieved by acknowledgement of the non-existence of a certain kind of reliability. All research depends upon this kind of judgment (understanding, insight) by practitioners, whether or not the results are couched in terms of rules or formal procedures followed. All domains are studied by both good and bad researchers, with good or bad judgment. I will say a little more about method in a later section.

5.6.2. Suggested Framework for Speech Perception Research

The following ideas are my suggestions as to how to begin to develop such a framework for the study of speech perception. It will be clear that it is greatly influenced by the philosophy discussed in Chapter 3 in its ideas of what human beings are like. I would like to stress my acknowledgment that it is also strongly influenced by and indebted to my understanding of research in cognitive science, speech perception, phonetics and linguistics.

From the perspective of these two sets of considerations, the broad, general statement that can be made about speech perception is that *there are people and they communicate with each other by means of speech as well as in other ways.* So far of course this says very little that would differentiate it from any other approach to speech perception: it is necessary to explicate its meanings before the statement can be fully understood. Its "obviousness" however should not be seen as a defect. In the course of its development, the method will explicate the obvious statement, and uncover less obvious features of the phenomenon.

The statement provides a background understanding which can be accepted and appealed

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[12]This feature is sometimes spoken of, preferably in my view, as a *spiral* rather than a circle (*eg* Radnitzky 1968:25).

to in explaining facts which arise with respect to this background, rather than as something that has itself to be explained in some other terms. The terms of the statement are accepted as the domain of enquiry - there is no suggestion that we should think of people in this context *as* such and such, or of communication *as* such and such. Similarly, it is the whole statement that forms the domain; there is no suggestion that we should focus on the process of communication or on the system of language or the sounds of speech in preference to people.

The next step in developing the framework is to make some preliminary divisions of the general statement. Again the following is my suggestion based on the considerations of the preceding chapters. I think we can understand the situation by giving it a tripartite division into Subject, Object and context, and considering the contributions of each to communication by speech. I will look next at each of these divisions in turn.

5.6.3. The Subject

The "people" in the broad statement can be thought of as Subjects in the sense developed in Chapters 3 and 4 (especially Sec. 4.2.2). A good deal has been said already about the nature of the Subject in speech communication, so the most important points can be briefly recapitulated here, in the context of the speech perception framework.

The Subject is a Whole[13], incorporating both "mental" and "physical" aspects, and possessing a point of view. It is the nature of the Subject that gives meaning to the World (which becomes the Life-world of the Subject). Thus the meaningfulness of the Life-world for the Subject is one of the basic facts assumed by this framework, which can be appealed to in explanation of other observations. The task of providing an explanation *of* meaningfulness and Subjectivity is thereby assigned to some other domain.

The Subject's point of view can be articulated to some extent by an Observer (who may be the same person in a self-reflective mode), but any such articulation is itself necessarily derived from a Subjective point of view, and can therefore never be claimed to be complete or accurate, expecially since the Subject's point of view is not fixed or constant, but varies.

It is from the combination of a point of view and an aspect of the world that Objects[14] are constituted in situations. Thus a crucial concept of this framework is that of the distinction between an aspect of the uninterpreted Life-world and any Object that can be spoken of. This distinction was discussed at length in Chapter 4.

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[13]That is, a Whole for the purposes of this framework; there is also of course the sense in which the individual Subject cannot be rigorously separated from the society, or from the World (see footnote 6, Chapter 4); on the other hand, from other points of view, the Whole person can be (tentatively) subdivided in other ways - *eg* (some branches of) medicine can concern themselves with the physical (in this case "physiological") aspect only.

[14]It is perhaps useful to reiterate the point that "Object" is used here very broadly, and not in its everyday sense. An Object is not necessarily a concrete "thing" - though it can be. Events, abstract entities, relationships, feelings, etc, can all be Objects. There is no special status for Objects with physical descriptions.

There thus arises in the present framework a very different understanding of "levels" of Objects from that of IP. At the lowest levels are the Things of the Life-world, with which the Subject can interact in some way; which have being ("ecological significance" in the Gibsonian phrase) for the Subject. They are not named; they have no essence, though they do have existence. They cannot be spoken about except by an Observer, who can constitute them as Objects from the Observer's point of view. At this level humans can be seen as similar to non-linguistic animals.

At intermediate levels Objects are constituted, given essences and named in their contexts. The Subject is aware of informal analogies, and reasons according to informal understanding. Analogies and comparisons can be made according to any dimension or aspect of the Whole; they are all equally "abstract". Language and culture, as well as our animal-like nature, have a strong influence on the way we perceive and understand. Importantly, however, at these levels we do not attempt to regularise and systematise the classifications and abstractions we use. We simply accept Objects as they are constituted in their contexts. To an Observer, therefore, these classifications and abstractions will be irregular and fuzzy. For example, to be a fully competent user of language, it is necessary to be able to abstract from language some formal Objects, such as "sounds", "meanings", "words" and so on. Individuals will do this in ways that show strongly influences such as those of the culture and its language-teaching policies. It is certainly not necessary for speakers to be linguists, or to know, at any "level of awareness", formal rules and patterns such as those regularised by linguists.

The "highest" levels are those of meta-reflection, the level at which we attempt to "make sense of the world". The Subject tries to take into account the context of an Object in giving it its essence. This level is highly influenced by cultural (and sub-cultural) effects in subtle ways which affect the Subject's point of view, criteria, values, etc. One way of making sense is deliberately to try to organise the world into regular patterns[15], which seem not so dependent on the contexts of an Object's occurrence. To continue the same example from above, this is the level at which linguists constitute linguistic systems and theories and their Objects.

This present analysis into levels is of course itself the result of activity at the third level. These levels have no "reality in themselves". People are not "made up of" a combination of the three: they have been "analysed into" three levels by me. I believe it is a useful way of understanding human Subjects in the present context, as I hope to demonstrate (especially in contrast with IP's understanding of levels of concrete-abstract.) However it is most useful if it is acknowledged as a "merely" useful analysis. Then the three levels can be understood as interacting in various ways. It might be rather rarely that some effect is best understood as being the product of only one level's activity.

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[15]Our Western culture seems to incorporate traditionally certain kinds of values according to which sense is made of the world by setting its Objects out in neat logical patterns. It would be very interesting to explore any ways in which other cultures with highly developed meta-reflective systems are similar or dissimilar in this respect.

5.6.4. The Object

IP makes a tacit decision to isolate the "speech signal" as the Object of perception in verbal communication. I will agree with the result of this decision - I think it is speech as sound that should be considered the most appropriate Object in this domain. It is important to be clear, though, that it is not the case that the actual acoustic "signal" is the only aspect of the situation which contributes to the hearer's interpretation of what the speaker is saying. It is not even the case that the entire communicative situation is a sum or complex made up of the "speech signal" plus other components such as gesture, visual cues, contextual information, and so on. Rather each of these is constituted, by an act of analysis, as an abstraction from the Whole. Crucially, the ability to understand speech in isolation from a situation is grounded in the ability to engage in linguistic communication in meaningful situations. People understand speech from radio, telephone, tape-recorder, etc by analogy with and abstraction from their experiences of speech in situations.

Thus in studying speech perception, we restrict the topic to cases where the speech is understood according to its linguistic meaning, excluding the (perfectly natural and common) case in which the sounds are meaningful is some other way, *eg* as indicating the presence of an angry French woman; or where the meaning is derived from the situation as a whole, more than from the particular words spoken[16].

So, though the speech signal is appropriately the aspect focussed on by those especially interested in speech perception as opposed to other aspects of the processes involved in communication, there will be times when it is necessary to invoke other aspects of the communicative situation in accounting for observations. It is important to be able to do this and to know when it is necessary.

Although I agree with IP as to what should be isolated from the situation as the Object of perception, I disagree as to how that Object should be described. As was seen above, IP equates "speech signal" and "speech signal physically described" (though of course the choice of which physical description it should be given was seen to be an issue of debate).

In the present framework, the whole issue of description is acknowledged as more problematic. The most important distinction to be borne in mind, as already discussed, is the difference between a description from the Subject's point of view and a description from the Observer's (*ie* researcher's) point of view.

From the Subject's point of view, of course, the most basic description of speech is one in

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[16]An everyday example shows the interaction of these two modes of understanding: If one is sitting in crowded railway carriage, or bar, with an empty seat nearby, and someone comes over, obviously wanting to sit in the empty seat, one's answer "yes" or "no" will frequently be formulated in response to either "May I sit here?" or "Is this seat taken?" without full attention being paid to which of them has actually been said - often resulting in an entertaining social dance.

terms of meaningful units (here, the question of which meaningful units is the issue analogous to IP's problem). So a general description of speech as heard by the Subject can be given as - a series of linguistically meaningful sounds. Such a definition of course will have to be further explicated - more below.

It is important not to understand this point wrongly. It is sometimes taken to imply that the Subject "hears" the meaning first and then the sounds - some bizarre kind of telepathy. Clearly that is not what I intend. To interpret it this way is to be stuck with the dichotomy of speech into "sound plus meaning". In the new framework, speech *is* "(linguistically) meaningful sound". It is sound that "enters the ear" - not disembodied meaning, but meaningful sound. To say that if we hear sounds we must be "really" or originally hearing acoustic features, and only then "converting" them into linguistic features is to confuse, as IP does, the Observer's derived description with the Subject's basic one. To the Subject, the Object's "sound" and "meaning" are equally abstract, both derived from a Whole "meaningful sound".

In my perspective, the Thing that is "entering the ear" can, from the Subject's point of view, be described[17] *basically* in terms such as "the word X", or "a word spoken by X", or "an English word", etc. There is no need for the conversion of a meaningless entity into a meaningful one, which, it should be stressed, motivates the whole machinery of the IP model.

From the Observer's point of view, the sounds can be described in any way that is deemed appropriate to the purpose. I believe, as I mention below, that this strict separation of the two perspectives can actually have a liberalising effect on some topics of research.

5.6.5. The Context

At this stage, "context" is a very general category, which will need to be further subdivided according to the needs of the domain. I can take only small steps towards this explication here. In IP, "context effects" can include anything from the effect of the acoustic nature of adjacent sounds, to the linguistic meaning of the speech within which a sound is heard, to the general meaningfulness of the situation in which an utterance occurs.

The first of these will be of less interest in the new framework, which studies speech perception from the Subject's perspective. It seems to be a product of a view of speech as a sequence of small acoustically-defined units which must be individually identified *as such* by the Subject. In the new framework, the Subject is not faced with this kind of task, as speech is organised at "low levels" (from the Subject's point of view) into larger meaningful units. More will be said on this topic below.

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[17]The point is that in attributing an Object to a Subject, an Observer must take the responsibility of demonstrating that the Thing from which the Object is abstracted could exist (*ie* be meaningful for) the Subject.

The other kinds of context, however, which are only beginning to be studied in detail by IP, will be of great importance in the new framework. At this stage a preliminary division can be made into linguistic context and non-linguistic context. A proper theoretical exploration of this division would have to consider in detail the the relation of the general meaningfulness of situations in the Life-world to linguistic meaning; and the use of language itself in the creation of situations - in short, what it means for a Thing to be "linguistically meaningful". Such an exploration would make a very relevant topic of study with considerable influence on both conceptual and empirical research in speech perception. Clearly an undertaking of this kind is well beyond what can be achieved at this early stage, and no definitive statement of the dichotomy can be made here. For the time being, I think it is fair to accept the division of linguistic and non-linguistic context as a practical guide. Exploration of the limitations of such a dichotomy can be part of the research undertaken in the new framework.

Accepting this, the non-linguistic context will not strictly be the focus of speech perception research, although it is clear that it affects speech perception in a major way. In particular, it is the basis of the possibility of speech communication. It is, as already discussed, through interaction with the non-linguistic context that speech sounds become linguistically meaningful to the Subject, and can be abstracted from such situations. The non-linguistic context however is notoriously difficult to study in a scientific way[18], and shades off rapidly to merge with non-linguistic sociology.

The linguistic context, on the other hand, will be a central focus of speech perception research. Perhaps the easiest way to maintain the distinction in the early stages of research is to focus especially on the process of understanding speech from radio, recording or, more problematically, telephone. Though the new framework dissolves some traditional problems IP faces in studying linguistic context, it has some other conceptual problems in their place. I will discuss these details more fully below.

5.6.6. The Subject's Task

It is now possible to consider the activity of speech perception itself as understood in the context of the new framework. Recall first, by way of contrast, the IP conception of communication as coding and transfer of a message, and of speech perception as decoding or conversion of sound to form to meaning. In the new framework, the very different understanding of communication gives rise to a very different understanding of speech perception - as a process of *interpretation*. Again this needs some explication to distinguish it

[18]Such research has been undertaken by two groups that I am aware of, though without in either case making particular reference to the problems of the perception of speech as addressed by IP. The first stems from the work of Malinowski and Firth on context of situation. Its best known research is by Halliday and Hasan (Hasan 1985, Halliday and Hasan 1985, Fawcett and Young 1988). The second is the research done by ethnomethodologists and conversational analysts, on the intersubjective constitution of situation and dialogue (Werth 1981, Schenkein 1978, McIlvenny 1987). At least some of this work takes its origin from a philosophical perspective not unlike the one I have outlined in the preceding chapters. The relationship between these two research-areas and speech perception would appear to be a mutually fruitful topic to investigate.

as more than a terminological difference from the "decoding" of IP. The Subject is seen as interpreting some Thing of the Life-world (recall this means something not already described or categorised in any way) *as* some linguistically meaningful Object(s). This does not imply transformation of one thing into another; or even interpretation of one thing as another. It is interpretation of some uninterpreted aspect of the World as meaningful according to a Subjective point of view in a context. We can call this Thing "sound" or "speech" or "an utterance", provided it is borne in mind that this is the Observer's shorthand. What the Subject will interpret the Thing *as* will vary according to a number of factors. It might in fact be found, as I suggested above, that in some or many cases interpretation as word-like units involves prior interpretation of the sound in some other way en route to its interpretation in terms of words. For example, in some circumstances a "pragmatic" or "discourse" meaning or even meaning as just-sound could be in some sense basic. This kind of question is a matter for research in the new framework. I will discuss it more fully below.

5.6.7. The Researcher's Task, Method and Tools

In the new framework, the task of the researcher (who is also a Subject in the sense meant here) is to understand, articulate and explicate - or describe in ever-greater detail - the Subject's activity in coming to understand the meaning of speech (bearing in mind the focussing of the topic as discussed in previous sections). The goal here, in particular, (though other valid goals are quite possible) is the description of speech perception from the Subject's point of view - with attendant caveats.

The general outline of the hermeneutic method has already been discussed, but a good deal remains to be specified with regard to the procedure of investigating speech perception within this framework. An important part of the task is not the *application* of a method, but the *constitution* of a method. A method is an abstraction, idealisation and formalisation of "what works" based on observation of many cases. As such it is necessarily tied to the domain in which it has been evolved. In the case of speech perception no specific domain is considered sufficiently analogous to allow the importation of its method as something to be appealed to in deciding how to go on. Rather it is necessary to develop a method appropriate to the study of speech perception as such (though of course, parts of methods from other domains can be used as deemed fit). The role of researchers' own judgment is therefore emphasised.

In developing a new framework for a new domain, especially one where the problems of conceptualisation are as great as they are here, it must be better to evolve a method slowly, comparing the kinds of reasoning and judgement that seems to "work" in different cases. In general this means that there will be an emphasis on informal observation, and description[19]

[19]Recommending informal description, I should perhaps note, is far from recommending either atheoretical description (which I have argued is impossible) or undirected or loose description (which would not be considered rigorous in this framework either).

from varying perspectives, of the process of coming to understand speech. On the basis of this kind of observation, experiments can be designed to allow exploration of ideas or hypotheses that arise. Note here the contrast with IP, in which ideas arising from experimental work are to be validated by application to "real speech". The reason for this attitude in IP is, as seen in Chapter 1, that direct study of real speech in everyday settings is prone to too many problems of control and interpretation. In the new framework, exactly the same reason is given for avoiding too early a retreat to the laboratory.

It is perhaps worth pausing here briefly to say a few words about methodological constraint and rigour. Naturally rigour and "objectivity" (in the sense of "intersubjective validity") are important qualities, in the new framework; but these are not seen as following necessarily from the application of an externally imposed method. Trust in particular methods or standards can easily be misplaced, especially if they are being applied outside the domain for which they were developed. IP puts a rather high premium on the formalisation of theories. "Rigour" in the new framework, as has been mentioned, is more concerned with interpretation and harmonising of details and broad views in terms of the hermeneutic spiral, than with the development of a formal theory. The ability to formalise an understanding can be useful; but too great an emphasis on formalisation can mean the sacrifice of understanding in terms of the relating of the theory to the actual situation - as IP itself acknowledges (see Chapter 1). IP suffers in particular, in my opinion, from a need to *constrain* what is studied, and how, to fit the needs of a particular idea of theoretical rigour - to the extent, often, of having to leave out of consideration factors that seem to have a major effect on perception.

In defence of the method recommended here, it should also be pointed out that even in its own estimation (recall Chapter 1), IP falls considerably short of an ideal of explicitness and formality. This is certainly not a criticism, since in my opinion to aim singlemindedly at such an ideal would be to miss most of the points about human speech perception. It does suggest though that declining to adhere to (all) the standards of IP rigour might not be too dangerous. It also suggests that in comparing the framework presented here with IP it matters whether one chooses as the comparison what IP really is, or what IP ideally hopes to be.

One particular point over which I disagree with IP method is that of the amount of attention paid to the **experience** of coming to understand speech. In the new framework, analysis of Subjects' own interpretation of what is going on as they listen to speech will be an important facet of the research programme. This is not the old bogeyman "introspection"; it is not to suggest that whatever description Subjects give of what they hear is simply to be accepted as evidence, without the kind of critical examination such reports require. (Particular examples of this point will be given below.) But descriptions and explorations of Subjective experience can and should be weighed in with all the other evidence on which judgments are reached. After all a Subject's "behaviour" is not more

reliably or unproblematically interpretable than his description of his experience[20]. In this respect I am in agreement with the framework for studying cognition developed by Lundh:

> "That verbal reports can give only a limited knowledge of what goes on in a person's mind ... is no argument *against* the use of verbal reports... Even if the data are incomplete, they are still data, and the more we have of them, the better." (Lundh 1983:166, his emphasis)

Regarding the tools that can be used for investigating speech in the new framework, these are basically the same as those available to IP researchers. The differences between the two approaches are more significant at the level of interpretation than of gathering of data. Many of the experimental paradigms developed in IP will continue to be useful, as will the techniques of modern speech analysis and synthesis. Obviously computational tools will be utilised for collection, storage and analysis of data. There is though one important difference - in the new framework, computational models of the perception process will not be relevant. Subjectivity in the new framework is thought of so differently that the analogy probably would not arise, and there would be no need to address the issue of how the success of an ASR system should be interpreted in relation to its success as a model of human speech perception. Enough has been said already for it to be clear that in the new framework, no such system, however well it performed, would be taken as evidence supporting the claim that human Subjects perceive speech in the same way. In fact, I believe that ASR systems are fairly good tests of the IP model, and, as has been seen, I take the fact that they suffer from difficulties in the areas of segmentation, normalisation, control and interpretation as significant in showing some of the shortfalls of the IP model as a description of human processing.

5.7. Effects of New Framework on Speech Perception Research

5.7.1. Introduction

It should be emphasised that the change of framework recommended here by no means entails that all the work on speech perception done so far should be thrown out, and a fresh start made. Much valuable understanding about speech and speech perception has been gained with the IP approach; indeed, as acknowledged above, development of the new framework would have been impossible without knowledge of the preceding thirty years' research. Many of the topics of research proposed in the new framework are similar to IP's, and in fact suggested by IP's own experimental program. However, the interpretation of results, and the way results lead on to posing of further questions, differs considerably.

Having this new framework allows a statement of the current state of understanding about speech perception which highlights different aspects from those which are brought out by the

[20]The situation here is similar, I believe, to that of medical interpretation: a doctor would certainly be hindered by being unable to question the patient about the symptoms experienced, though surely accepting a patient's self-diagnosis at face value is not to be recommended either.

IP framework (see Chapter 1). Incorporating IP's results into the new framework sometimes involves reinterpretation and a change of direction. In the sections which follow I will mention some of the similarities and differences between IP and the new framework, by outlining the central areas of empirical research opened up by the understanding of speech perception set out in the first parts of this chapter.

5.7.2. Factors affecting Perception

The preceding discussion has allowed a preliminary characterisation of the domain of enquiry, and abstraction of a particular aspect of it as the topic of research. In the present case, the topic has been provisionally defined as the process by which Subjects interpret or come to understand utterances in situations. The next step in the defining of the framework that I would like to address is that of abstracting, again in a preliminary and provisional way, the factors that can be seen as affecting the process and its outcome - loosely, the factors that cause a Subject to understand an utterance in a certain way.

It may seem rather long-winded to go through this whole process of definition, rather than simply accepting the obvious. However I believe it is important to take time over this stage, for several reasons. Firstly, it emphasises the point that the factors so defined are indeed abstractions from a Whole, and imply a Subjective point of view. There is no "real" or "objective" sense in which the factors isolated here are "causes". It will undoubtedly be necessary in various instances to break down the divisions between these factors, or to refer to aspects of the Whole situation not neatly included in this categorisation. Doing so will be much easier if the abstract nature of the categorisations is clearly perceived.

A second advantage of taking some time to deliberate over the constitution of factors is that it should encourage awareness of the distinction between the Observer's and the Subject's perspectives, which I have argued is crucial in this domain. Of course, it would be quite untrue to suggest that the Subject's point of view as described here "really" represents the Subject's "true" perception of the World. It will be, necessarily a *description* of the Subject's point of view, and influenced by the Subjective perspective of the Observer. This is the kind of Subjectivity that I argued in Chapter 4 is absolutely ineliminable from all theorising. The fact that the goal of describing the Subject's point of view cannot be perfectly achieved, however, need not deter us from making the attempt: it is, for all the reasons I have given so far, a valuable distinction to maintain. Acknowledgment of the impossibility of maintaining it perfectly should in fact be a help rather than a hindrance.

Here then, I present my suggestions for a preliminary classification, within the domain outlined above, of the factors which seem to affect the interpretation given to an utterance-Thing.

The most obvious factor to identify is the nature of the Thing heard: what one hears depends to a large extent on what is there to be heard. Again, though this might sound so

obvious as to be hardly worth saying, there are several respects in which great care must be taken in phrasing and accepting it. Firstly, the problem of the description of the Thing must be addressed; secondly, the fact that this factor is only ever one, contributing, factor, in an interpretation, not the sole cause of a percept should be borne in mind in developing a theory. Both of these points will be taken up in greater detail below.

Another major and obvious factor which can be isolated at this stage is the nature of the perceiving Subject. This is clearly a complex factor, which will require refinement and clarification in the course of research. Several points merit some mention here however, which contrast with the view made obvious by IP. In the new framework, "Subject factors" are always relevant. This might be argued to be an implicit commitment in IP as well, but the two positions are not identical (*cf* the discussion of "top-down" and "bottom-up" processing above). In the new framework, a system which can be described as responding to stimuli of certain descriptions is not "perceiving speech" in the relevant sense. But to deny such bottom-up processing is not to say, as for example Cole does (*cf* Chapter 1), that all perception involves an IP-style top-down component. His reason is that without this, the ambiguity of the signal would prevent effective recognition. My position is that without the "Subject factors", there would be, far from too many meanings in the signal, no meaning at all of any kind, for the Subject.

There is, then, a very loose sense in which these two kinds of "factors" can be compared to the "bottom-up" and "top-down" processing of IP. It should be pointed out though that to speak of Subject and signal factors is not to take over, and distort, concepts that arose within IP, or that depend in some sense on the IP framework for their existence. The idea that understanding speech depends on the Subject's expectations or "set" or "habits", as well as the sounds presented, goes back well before IP (*eg* Scripture 1902). It is also a major component of "folk" understanding of perception. The "top-down/bottom-up" distinction was the mechanism that IP provided to account for this feature of speech perception; the feature did not arise in relation to the distinction.

It will be noted that at this stage in the development of the alternative framework, I am using a good deal of terminology that belongs with the IP framework. This has the disadvantage that such terms do not always fit very well with the new conceptualisation of speech perception. However, it is probably best to keep them for the time being, until more appropriate ones emerge around research centred in the new framework. One reason is that since most of the empirical knowledge so far available about speech perception stems from the IP tradition, that knowledge is naturally couched in IP terminology, and translation is both difficult and distorting. Another is that it is still unclear, in the early state of development of the alternative framework what terminology to translate into. Once some empirical work has been carried out, this problem should be resolved in a more natural way than could be accomplished by imposition of vocabulary at the present time.

So far I have identified two kinds of factor affecting the Subject's interpretation: those to do

with the sound and those to do with the Subject. There is a third factor to mention, though its status is, as discussed briefly above, less clear than that of the first two: the context. The reason its status is unclear is that it depends on the prior constitution - to some extent at least - of the Object; it is only with respect to the Object that the context can be defined, as something like "aspects of the situation other than the Object". It is thus very much relative to the Subject, and discussion of it is prone to confusions of point of view. Nevertheless, there does seem to be an important sense in which the context plays a role as a factor in speech perception[21]: it seems that "the same Thing" can be held constant, and yet, with a variation in context, perceived differently. There are however many conceptual pitfalls here, and this factor will therefore be considered even more provisional than the other two. It might well be revised, or subsumed into one or both of the preceding factors.

Having thus outlined a general framework for thinking about factors affecting the interpretation of utterances, I can now look in a little more detail at the consequences of the new way of thinking for the interpretation of our knowledge about speech perception.

5.7.2.1. Subject Factors

As has already been pointed out, in the new framework, the Subject is always relevant. Without a Subject, there would be no Object "speech" in any description at all. In the new framework, then, there is no such thing as "bottom-up recognition" of features, which, in IP involves recognition by the Subject of Objects as described by the Observer. Rather the aim is to understand the description of the Thing "speech" as it is interpreted by the Subject. Naturally, this involves having some background understanding of the point of view of the Subject (as well as some understanding of the nature of the Thing). The two are complements and cannot be understood in isolation from one another.

Already in the first stage of defining the framework, a good deal has been said about the Subject which has significance for the description of the Thing. Given a Subject such as that described above, any Object must be a meaningful one, either in terms of the situation or according to a linguistic meaning. Saying even this much makes for some significant differences between IP and the new framework. In particular, some "obvious" facts that in IP are "surprising" or "paradoxical", requiring explanation in terms of transformation of "low-level" units into "high-level" units, are quite straightforward in the new framework:

> "One of the most striking phemomena in the perception of speech is the degree to which our conscious experience follows the semantic intentions of the speaker. Our conscious perceptual world is composed of greetings, warnings, questions, statements, while their vehicle, the segments of speech, goes largely unnoticed, and words are subordinated to the framework of the phrase or sentence. Nor is this 'striving after meaning' a mere artifact, confined to situations in which we want to understand rather than analyze, since our ability to analyze speech into its components is itself influenced by higher-level units." (Darwin 1976:175)

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[21] *Cf* the discussion above, which mentions several respects in which the understanding of "context" differs between the two frameworks being compared here

Similarly, IP phenomena such as the grouping of segments into words, "real word effects", or "phoneme restoration" are quite unproblematic. Subjects are thought of from the outset as interpreting speech not as features, phonemes, etc, but as words and other meaningful units. Compare this to the IP view, which has to invoke subject factors in the form of knowledge, expectations, response bias, etc, to account for these ubiquitous effects. This is necessary only in a framework which can (and must) rely to some extent on "bottom-up" processing. For all the reasons given above, there is no role in the new framework for what is called in IP "bottom-up recognition".

Of course, it is not sufficient merely to state that whatever the Subject hears will be something meaningful. Further explication is required. The *particular* way that "sound" is interpreted - *ie* the particular Object heard - depends (partly) on the Subject's point of view on a particular occasion. Recall what is meant by "point of view" in the new framework. It is not something made up of component parts or modules (as it is in a cognitivist view like that of Minsky - see Chapter 2). It is rather a fluid, non-explicit attitude or way of being. It is certainly possible to abstract, analyse and describe some of its aspects or characteristics, which can be spoken of as knowledge, skills, purposes and so on. To speak in this way is to make explicit and categorise (articulate) from an Observer's perspective. There can be no suggestion that the Objects thus constituted exist *as such* in the Subject (though one might well defend strongly the existence of the Thing that is described).

So this view makes for some significant changes from the IP view of Subject factors. Though a Subject's knowledge is clearly relevant to the way the Thing is interpreted, the kinds of knowledge that the Subject is attributed, and the manner in which it is said to exist, will be different. It is no longer necessary, for example, to account for "acoustic context effects" by postulating particular kinds of knowledge represented in the processing system[22]. Also, since there is no commitment to the idea that the Subject is a formal device, there can be no arguments based on the notion of formal similarity among Subjects. In this I differ strongly from Cutler's view (1988[23]) that a single example of an error can be used as evidence of a general feature of the processing mechanism.

As pointed out above, the Subject's point of view is not fixed and constant, or uniform across many Subjects. In fact, the dimensions of similarity and difference among Subjects that are relevant to the domain of speech perception have not yet emerged. Thus it is important in the new framework to focus on description from various points of view; and on individuals' interpretation of speech and speech perception in particular situations - what in IP is called studying individual differences, but might well in the new framework turn out to be individual similarities. There is in the IP approach a small tradition of research looking at such

[22]Compare Ohala (1986) who uses Subjects' "knowledge" as evidence for the variability of the signal.

[23]Though her argument is made with respect to speech production research, I think similar reasoning operates in speech perception research.

characteristics of individuals, their personal approach to speech perception (*eg* Witting 1962) or their language background and expectations. In the new framework, this will become a much stronger focus of interest.

The emphasis given in the new framework to the idea that there is no "right" description of the sound "as it really is" has implications also for the understanding of the effect of the Subject's point of view on the interpretation of sound. The Subject does not immediately and definitely reach a decision as to the "true" description of the sound. Rather the interpretation of what the speaker has said is a process of interpretation according to evidence. More than one possibility can be entertained before a final decision is made. The process of interpretation thus involves the hearer's *judgment* of the interpretations that arise spontaneously according to the interaction of Subject and Thing. More will be made of this concept below. For the moment it is relevant to point out that for IP to speak in these terms - such as "judgment" and "evidence" (indeed any top-down processing) - involves difficulties in accounting for the *control* of the processes of perception. The "control module" often invoked is simply another name for the homunculus that I have argued the IP model as such implies. In the new framework, "control" in this sense is not a problem. The Subject as a Whole is by definition purposeful and able to direct and control its actions according to whatever projects are engaged in. This is a characteristic, it should be emphasised, of a Whole Subject, not of a "perceptual mechanism" or "processing system". This is thus a case, like those of "consciousness" and "meaning" discussed above, where an *explanation* of the purposeful nature of Subjects cannot be achieved in the same domain as it is used as a ground of explanation. Responsibility for any such explanation is thus assigned to some other domain.

5.7.2.2. Sound Factors

The second major category of factors affecting the perception of speech is those to do with the nature of the sound heard. This is the area in which we have gained the greatest amount of empirical knowledge from research in the IP framework. In the new framework this knowledge is valuable, though some significant differences of interpretation show it to have limitations which I will mention here. Recall from the discussion above that by "sound" in this context is meant an uninterpreted or undescribed Thing, which the Subject of speech perception Objectifies as a linguistically meaningful sequence. The description of this sound then is a major component of a theory of speech perception. There would seem to be two kinds of approach to this description: the point of view could be that of an external Observer, noting relationships between one Object (sound) and another (reported percept), and developing a predictive theory about these relationships; or an attempt could be made to describe the sound and the process of its interpretation from the point of view of the perceiving Subject. IP, I believe, falls between these two possibilities.

Consider first the general approach to the description of the signal in IP. As seen in Chapter 1, this is a major area of research and indeed contention among speech perception

researchers - whether, in general, an acoustic, auditory or articulatory description should be used. Though there are many differences between these kinds of descriptions, they are all alike in being descriptions of the "form" of speech, as opposed to its "content" or meaning. Much of the argument above has been directed towards the conclusion that any such description involves the background understanding of a Subject who understands speech - *ie* the Observer. None of them could be the description relevant as most basic to the perceiving Subject. For the Subject, the most basic description must be *as (linguistically) meaningful sound.*

Next, consider the more detailed description of the speech signal in IP. This also is a major area of debate - whether the description should be in terms of features, phonemes, syllables, or what. Again, these are similar, despite their differences, in being segmentations of the "form" of speech as opposed to the "content", and again from the present perspective they are thus abstract, Observer-relative units, rather than being basic to the perceiving Subject. There is only one exception to this - the choice of the *word* as unit. It was seen in Chapter 1 that the word has not, traditionally, been a popular unit of description. This is, I surmise, partly because of the difficulty of defining it formally (though interestingly, none of the other units have proven easier to define formally), and partly because of a bias towards considering small things as "lower level" than bigger things.

In the new perspective a very different opinion of words emerges. An *informally* defined unit of linguistically meaningful sound is precisely what is sought as the lowest level description *from the Subject's point of view.* A word-like unit would seem to be a good candidate for this role (*cf* Cohen 1986, Nooteboom 1979, 1981, mentioned in Chapter 1). There is no sense in which, from the Subject's point of view, communication is the sending and receiving of a stream of phonemes or other such units: these are abstracted from units at the level of words and phrases by comparison of many instances with a particular kind of guiding purpose.

Taking this view has significance for several areas of IP research. There is now no reason to see the process of speech perception as involving a transformation of small units into a more ideal (canonical) form, or of top-down information overriding bottom-up, or of integration of various disparate kinds of information-Objects. The *cues* to speech sounds are thought of quite differently. It is true that in many cases something that can be described by an Observer as a small change in one aspect of the signal can cause a major change to the percept. But this does not imply that the Subject perceives that particular aspect of the signal *as such* on the way to forming a percept of a Whole. From the Subject's point of view, the change is a global alteration of the Whole sound; of the relationships of its parts. (This is the point made very forcibly by Gestalt psychology.) Here again, the identification of these "cues" or "features" as such depends on an abstraction from a Whole by a Subject with an Observer's point of view, identifying them first as literally features or aspects, and then categorising, reifying and Objectifying them as features or "cues".

This way of understanding the relationship of cues, features and units would appear to be helpful in considering an interesting paradox that arises from the IP perspective (though to my knowledge not often discussed as being paradoxical). From work done over the period of speech perception research, two general kinds of results have emerged. First that the Subject can make a linguistic interpretation of sound given only the grossest features, or under very poor listening conditions. Second, that the Subject's interpretation can be influenced by what seem very small or subtle changes in the signal. From the IP perspective this is a contradiction that must be resolved, and has led to considerable debate as to the weight of arguments based on one or other of these observations, and the implications for a general processing system. In the new framework however, the apparent paradox provides a topic for exploration and explication. It can be acknowledged that the measurement of the salience of different aspects of the sound is done from the Observer's perspective, rather than the Subject's; and that in any case there is no reason to think that all speech perception should involve the same kinds of (formal) processes or the same kinds of (formal) units. Rather there is the encouragement to explore the circumstances under which different kinds of observations can be made, and interpret these observations in relation to the understanding of Subjectivity suggested in this chapter.

Finally, we should consider the role of the perceiving Subject as Observer. The ability of Subjects to reflect on and abstract from their own (linguistic) behaviour, constituting Objects and (informal) relationships was discussed above. To be fully linguistically competent, a Subject must be able to constitute as Objects not only word-like units but also units of sound-only (though of course in the perspective developed here these are more, not less, abstract than meaningful Wholes). The kinds of Objects that the Subject will constitute in this way appears to depend on a number of factors, such as language background, educational culture, literacy, knowledge of alphabet, and so on, as well as on particular characteristics of the situation.

The knowledge gained from IP research is most commonly of the kind which predicts segmental percepts from acoustic cues[24]. Recall from Chapter 1 that an important reason for the wealth of research in this area has been its relative amenability to IP methodological constraints: it is felt that since the researcher can control the stimulus and be fairly sure of the percept (from the Subject's report or behaviour), this research is less prone than others to major difficulties of interpretation. Of course, this is not the view that arises in the new framework. Here the *description* of the stimulus from the Observer's point of view and the *description* of the percept from the Subject's point of view are not so straightforwardly relatable.

In particular, any description by the Subject of a percept in terms of individual speech

[24]"The bulk of research on speech perception over the last thirty years has been concerned principally, if not exclusively, with feature and phoneme perception in isolated contexts using nonsense syllable materials." (Pisoni 1981:257)

sounds or "nonsense words" will be seen as *more abstract than* a description in terms of real words or phrases, since it could only be achieved by analogy with abstractions from perception of speech in real situations. Thus, Subjects can identify sounds like [pa], [ta], [ka] as such only because they can speak a language: a nonsense word only *is* a nonsense word to a Subject who understands "sense words". There should be no suggestion that a Subject must hear some Thing *as* a small meaningless unit *en route* to perception of it *as* part of a longer, meaningful word.

This allows a preferable interpretation of the phenomena usually called "categorical perception". Traditionally, Subject's behaviour in categorical perception experiments has been taken as evidence of categorisation of units of the signal at low levels of analysis: if the Subject identifies [pa] [ba] and so on even without any high level information, it is argued, we can assume that the same ability operates in ordinary speech perception. In the new framework, however, this argument does not hold. The Subject in this situation is Objectifying the sound by analogy with what he or she is used to hearing in meaningful speech, and in accordance with the description of sounds usually used in the community. There is no reason to suppose that in understanding meaningful speech in an ordinary situation the Subject "goes through" an analogous stage of recognition. (Considerable support for this interpretation of categorical perception is to be found among the examples given in Repp 1984.)

5.7.3. The Process of Perception

In the new framework, as in IP, perception can be thought of as a *process* taking place over a span of time (though, as need hardly be said, the characteristics of that process are very different in the two approaches) and investigation of this process would be as important an area of research as investigation of the factors already discussed. The focus of interest is on the process by which a Subject reaches an interpretation of what someone has said. Again, this statement has a superficial similarity to IP's statement of interest; but again there are some very significant points of difference. The process can be seen here as one of interpretation, constitution (Objectification) and judgment. More than one interpretation can be entertained before one is judged to be the "correct" one. The constraint is that any interpretation must result in something meaningful to the Subject - but of course as already seen the kinds of ways speech sounds can be meaningful in situations is very variable. The process of coming-to-understand can be seen as a process of interpretation and reinterpretation (perhaps itself something akin to the hermeneutic method of the human sciences). At each stage, the interpretation is of some Thing *as* an Object meaningful to the Subject. In the usual case, after a certain point, the Subject is relatively confident of the particular interpretation reached, and acts in accordance with it. It is not however always the first interpretation reached; it is very common that several interpretations are entertained briefly before one is settled on. The preliminary interpretations are not usually reported, unless there is some special reason to do so (for instance, if the preliminary interpretation is

amusing in the context); the evidence required for changing the interpretation arrives very shortly after the interpretation has been made. This state of affairs is not always the case, however. It sometimes happens that one interpretation is accepted for some time before evidence is gained to change it. This is the situation known as a "hearing error"; it will be discussed in a little more depth below. It also occasionally happens that no satisfactory interpretation is reached on the evidence available. In that case, more evidence can be sought, or, occasionally, the hearer is simply left to puzzle over the available evidence.

This view of speech perception as a process of interpretation allows emphasis on the continuity of different kinds of interpretations-*as*. Although in speech perception research, as I have recommended, we should be most concerned with the processes whereby the Subject comes to an interpretation of a sound as a linguistically meaningful sequence - its "message-meaning" as it is sometimes termed - this is only one of many kinds of interpretation that the hearer must be able to make. It is also necessary to interpret an utterance as part of a discourse or conversation (*eg* as an opportunity to take a "turn" at speaking), as part of an interpersonal relationship (*eg* as an insult or a reproach), or as the means of maintaining social cooperation (*eg* as a request), to mention a tiny number of the possible examples. It is not possible to divide these different kinds of text-like interpretations clearly from the interpretation-as words and sentences. They will interact in ways which and to an extent which is yet to be discovered.

Once again, this view has implications for the interpretation of the facts known within IP, some of which I can perhaps exemplify by considering briefly the research on word recognition set out in Chapter 1. The main issue there, it will be recalled, was the debate between the "phonetic" approach, in which word-forms should be (nearly) fully specified before lexical access, making the investigation of low-level cues to word boundaries a key topic; and the "psycholinguistic" approaches, in which lexical access is more interactive, making investigation of "on-line" word recognition a key topic. One can certainly agree with the criticisms by the psycholinguistic approach of the phonetic: that it is implausible that a matchable form could be fully specified with no (or little) account being taken of the meanings of the words. But this need not imply support for the more interactive psycholinguistic models. The alternative they offer is not nearly radical enough. It still retains the basic idea that speech perception is a translation or mapping of sound to meaning - which is the misunderstanding that creates the need for "interaction" in the first place. In the new framework of course the description of speech as a series of linguistically meaningful units is basic, and the Subject is assumed to be of a nature which can accomplish this[25]: no translation or interaction is necessary. The "word boundary cues", "recognition points" and so on are, like other such Objects, abstractions from the Whole, requiring background understanding and comparison of many instances. So again, a fact that is surprising or

[25]Any Subject which can recognise "features", I have argued, *must* already be one which can recognise meaningful speech.

counter-intuitive to the IP perspective is quite in keeping with the new perspective (recall the quotation from Cutler 1987 suggesting that it is "odd" that speakers do not mark word boundaries more "clearly").

The definition of a "recognition point" in the sense meant by IP theories presupposes a judgment by an Observer as to when the word has been "correctly" identified. In the process of recognition, a speaker might entertain a series of interpretations, judging them according to the available evidence (McAllister 1988 gives some examples of cases where the researcher's judgment as to whether the Subject has "correctly" identified an utterance *has* affected the interpretation of experimental observation). A similar point can be made with respect to acoustic cues to word boundaries: it is only an Observer who can identify words who can identify word boundaries, classify them, and abstract features they have in common. Features that tend to be associated with word boundaries might well be used in the absence of any other information (as in a word-boundary experiment) to make a decision as to the likely location of a boundary. But this should not be taken to imply that this decision is in some sense "correct"; much less to imply that an analogous decision is made at "low levels" in the normal case of perception. The point of the last paragraph can perhaps be highlighted by contrasting the IP perspective on word boundaries (as given in a quotation from Nakatani and Dukes 1977 in Chapter 1) with that of the present perspective: Nakatani and Dukes say that to understand speech, we must know where words begin and end; in my view, it is preferable to say that to know where words begin and end, we must be able to understand speech[26].

5.8. Errors in Perception

In this final section I would like to provide an example of the effect the new perspective presented here has on the interpretation of observations in an area of speech perception research. I have chosen as the topic of this example the interpretation of "hearing errors" or "slips of the ear". A small but rather well-known amount of research has been done on this topic in the IP framework, usefully summarised in the Introductions to Fromkin (1980) and Cutler (1982). Most of the research has involved collecting and analysing spontaneous hearing errors as experienced by or reported to the researcher. Some has involved deliberately inducing errors by creating difficult listening conditions, most often by playing speech to subjects through white noise (the classic example is Miller and Nicely 1955).

Some of the main findings of this work have been, in IP's interpretation, as follows. Firstly, that Subjects try hard to make sense of what they hear, *ie* they try to parse it into meaningful words and phrases. This is taken as a demonstration of the contribution of top-down processes to perception. Many errors involve the inappropriate application of knowledge or

[26] "We may write down every sound ... but we shall never be able to analyse the sentence into separate words until we know its meaning." (Sweet 1906, quoted in Cohen 1987)

expectations - taken as strong support, as seen above, for an IP model over a behaviourist or Direct Perception model.

More specifically, it has been found that some parts of the signal are less prone to errorful perception than others: the general prosodic pattern of an utterance is usually understood correctly, and within it, the stressed syllables (especially their vowels) are considerably less prone to error than other parts of an utterance. Consonantal confusions are relatively rather common, with certain patterns of confusibility (*eg* among members of the same broad phonetic class) well known. Errors are generally classified according to the size of the unit involved (feature, phoneme, syllable, etc) and whether the error involves an insertion, deletion, etc, of that unit. The fact that these are the units involved is usually taken as evidence of the salience of such units to the processing mechanism (*eg* Bond and Robey 1983). Observation of the patterns of errors have prompted suggestions as to the kinds of *strategies* hearers use in creating a percept (*eg* Celce-Murcia 1980:206, Garnes and Bond 1980:237); and the kinds of response bias that result from exposure to differential language experience (*eg* Goldstein 1980).

The new perspective, I believe, allows a preferable treatment of these kinds of phenomena. In the first place, it questions the definition of "error" which motivates the IP account. IP seems to accept a "common sense" understanding of "error" as the hearer failing to perceive what is "really there", or was "really said". This does not bear much scrutiny, however. Sometimes when the hearer fails to perceive what is "really there" it is considered "correct" perception (*eg* when hearers overlook errors of production). Some accounts therefore rely instead on some notion of an "intended" message which the hearer can succeed or fail in perceiving.

From the perspective developed here, it is clear that what is going on is a confusion between a Subject's and an Observer's perspective. The Subject's interpretation is being compared with some other interpretation. In the new framework, which tries to keep these perspectives separate, it is clear that to the Subject at the time of perception, there is no difference between an erroneous and a true interpretation[27]. It is a later judgment to say that the first interpretation must have been an error, and to attempt a revision. Thus the decision as to whether an interpretation is correct or not is seen, in the new perspective, as an integral part of normal speech perception. Perception involves interpretation and judgment by the Subject. So "errors" in this perspective become evidence not of the normal mechanism breaking down, but of its healthy operation, showing the interaction of Subject and Sound factors in a process of interpretation.

This understanding in fact allows support for some of the remarks made above. Firstly, whatever is heard (whether judged later to be erroneous or correct) is heard *as a sequence*

[27]A similar point is made by Bierwisch (1983).

of words. This, I believe, lends support to the view that an interpretation as linguistically meaningful units is the first stage of perception, rather than a sequence of sounds which are later put together into a meaningful sequence. Compare the IP account of the same observation, which involves postulating strategies like "find a word" and "find a phrase" (*eg* Garnes and Bond 1980:238), and accounting for how errors at "high" levels can "cause" errors at "low" levels (Bierwisch 1983).

Consider the classification of errors by IP into those involving different sizes of unit. Of course it is well understood in IP that the establishment of the size of unit involved in a speech error (of production or perception) is problematic (*eg* Cutler 1988) - is the perception of "fan" for "van", for instance, an error involving a feature, phoneme, syllable or word? From the new perspective, as outlined above, the position is clear. "Errors" involve the interpretation of one meaningful Whole rather than another - in just the same way as "correct" perception does. The description of errors as the mistaking of one segment or feature for another (or the insertion or deletion of such a unit) is only possible for an Observer with an opinion as to what would be correct and an framework for analysis.

Of course, some sounds certainly do seem to be more "confusible" than others, and thus more prone to error. This too can be seen in the context of the new perspective. These "sounds" are seen as (for the Subject) aspects or dimensions of words - thus literally as features, rather than entities. Indeed it is from these dimensions of similarity that Objects such as "sounds", "phonemes", "features", and so on can be abstracted.

Here I have talked very generally about the interpretation of hearing errors in a theory of perception. There is not space to enter into a detailed consideration of the particulars of error classification and interpretation. However, I would like to mention an interesting area for future investigation which arises from consideration of the topic of hearing errors in this perspective. A rather "obvious" interpretation of errors - in both IP and the new framework - would be the suggestion that the hearer initially interprets the Sound in terms of expectations arising from the communicative situation. However, although it is often the case that expectations affect perception in an apparently straightforward way[28], this is by no means always true[29], as also observed by Fromkin:

> "To 'hear' *prodigal son* when the speaker said *popping really slow* is more mind-shattering than hearing *carcinoma* for *Barcelona*, although even this incorrect phonologically similar word ... must have created a very anomalous utterance." (Fromkin 1980:11)

It would seem then that the "obvious" understanding of the interaction of Sound, Subject and Context factors will have to be modified.

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[28]Such as "But lizards don't even have teeth" heard as "At least when it's done we can have tea".

[29]Compare "Edinburgh's slightly superior" heard as "Edinburgh's in the Soviet Union"

5.9. Conclusion

This thesis has been mainly concerned to provide an analysis of the philosophical foundations of the IP model of speech perception. In this last chapter, however, I have also been able to suggest an alternative approach to speech perception, stemming from insights gained in the course of the analysis. This alternative is likely to prove fruitful as a framework for exploration of a wide range of issues of speech perception and also other topics. The last part of this chapter has made a few suggestions as to how study in such a framework could be conducted and the effects that the change of framework might have on the interpretation of various observed phenomena. It is important to note that these suggestions and remarks have been made with reference to the similarities and differences between the new framework and that of IP. This is necessary at this early stage, largely because explication of the new framework requires relating it to more familiar concepts. Of course, it will not be for long that the new framework must, or even can, continue to develop in explicit contrast to the existing framework of IP. After a time it will gain its own identity, and establishment of points of commensurability will cease to be the responsibility of its practitioners.

One key characteristic of the new framework, as already stressed, is the extra dimension of rigour given it by its commitment to the "circle" of interpretation. Any observations or theoretical conclusions must always be related back to the broader perspective - to what they "mean" in terms of what the Subject is doing in the communicative situation. This means there is far less distinction in the new framework between "conceptual" and "empirical" work - the two are intimately related, and both are essential components of good theory. (I will say a little more about the feeling that "philosophy" is "speculation" and distinct from "observation" below.) The strong commitment in the new framework to the relativity of Objects, criteria and methods to the domain of their constitution should perhaps also be reiterated: this also increases the need for rigorous conceptual work in evaluating the relevance of the "obvious" in this particular area. The subdivisions of the field will emerge more clearly as work progresses.

Naturally it is impossible to predict what research in the new framework will be like in the future, but it would seem interesting to mention the directions I see the work taking, from the standpoint of the present - though unfortunately there is not space to do more here than mention topics. Here I will consider briefly the use of this framework for studying speech perception. In the general conclusion, below, I will consider some implications the analysis I have conducted would seem to have in other areas.

One strand of work in the development of research in the new framework will involve observation and experimentation of speech perception in a wide range of different settings. Here the decreased emphasis on development and defence of theory as such will allow more flexibility and less constraint than is found in IP. The new framework encourages breadth rather than depth - though of course observations will be interpreted in terms of the broad statement and its elaboration in the framework. Studies of perception of languages

other than English and European would seem to be especially important; and research on perception of non-native languages of subjects would be useful to both theory and practical application. The understanding of perception presented here has also, I believe, important implications for the interpretation of work on children's perception of speech, and research in this area could contribute greatly to our understanding of the nature of language and linguistic meaning. One area that might provide an interesting path of extension of the speech perception work is that of conversational interaction. Considerable work, as already mentioned, has been done in this area by other groups. Collaboration, I would like to think, could be mutually beneficial.

Another, closely related strand of research will involve refinement and extension of some of the more philosophical discussion of the last two chapters, especially those parts that have to do with language and communication for the Subject. The nature of linguistic meaning, for example, which has barely been touched upon above, provides a rich area for exploration of many issues around the concepts of *representation* and *symbol*. Perhaps a comparison of the approach of the approaches of semiotics (*eg* Eco 1984) with that of phenomenological philosophy would provide a starting point.

Conclusion

The analysis reported in this thesis has had a very specific aim - that of uncovering what seem to be essential features of the philosophical foundations of the IP approach to speech perception - and has therefore been rather narrowly focussed. In the course of achieving this aim, however, it has made a number of points that I think have consequences beyond the particular domain of speech perception research. As a footnote to the research I have done here, therefore, I would like to exemplify the kinds of implications the analysis has.

Perhaps it is useful to begin by recapitulating some of the most general points I have made here. Firstly, in considering the nature of the world (the Life-world), I made the distinction between Thing and Object. What is given (encountered, experienced) in the Life-world is the Thing: a Whole in the sense developed above, which has, in a sense, a nature, but no meaning or essence in and of itself, and no objective description. The Thing is thus very difficult to conceive of, or talk about. In describing or classifying the Thing, we create the Object. Though commonly in the normal course of our lives, we accept the essence of the Object as if it were given in its own nature, I hope I have been convincing in arguing that any Object implies the operation of a Subjective point of view (in the sense developed above). Creating an Object always requires *abstraction* from the Whole, which can only be done relative to the purposes and values of a Subject in a context. Taking these points seriously has major consequences for the nature of the Subject postulated in a philosophical framework. Most importantly in the contemporary academic climate, it implies that the Subject could not be a *formal device or system*.

I have made a good deal of these points in the preceding pages - but always with respect to the specific domain of speech perception. It seems likely that some of my points have relevance beyond this, especially to other areas of cognitive science. For example, the idea that perception can be seen not as transformation of one Object into another, but as the constitution of Objects; or the general need to consider explicitly the Subject for whom an Object exists, and demonstrate the meaningfulness of some Thing from which it could be abstracted; or the careful distinction between Observer and Subject would all seem to be widely applicable ideas.

Considerable caution is needed, however, in making such an application. It is important that the results of the particular analysis undertaken here should not be sedimented and extended beyond their proper limits. Consider the topic of speech production (*eg* Macneilage 1983, Butterworth 1980, Levelt 1989, Perkell and Klatt 1986). On the face of it this might seem a domain very closely connected to that of speech perception. Like speech perception, is studied by both phoneticians and psycholinguists, and, like speech perception, almost exclusively according to the information-processing approach: the Subject is seen as transforming an idea or message into a sequence of linguistic units, and thus into a set of muscle commands, in something like a reverse operation to that of speech perception. Although I believe that some of my general points about the nature of Subjectivity have great

relevance to this view of speech production, it is certainly not possible to take over specific points I have made about one domain into the other. This is thus an illustration of the principle of domain-relativity just discussed. Speech for the speaker is a different Object from speech for the hearer (as shown for example by the very different patterns of "errors" made in speaking as opposed to hearing speech). An analysis of the information-processing approach to speech production analogous to the one I have undertaken above would have to involve consideration of the philosophy of *praxis*, and consider the Subject as *agent*. Work of this kind has been done by phenomenological and other philosophy, but I have not touched on it at all here.

The kind of relevance I would like to see my work as having for an area like speech production is thus at a deeper level than the transferral of particular results. Speech production research, too, involves the choice of a relevant *description* of speech. So the principle of seeing a description as a product of a relationship between a Subject and an aspect of the World is relevant. The key point is to avoid confusion of the point of view of Observer and Subject. For the Observer, the description might be of physical or physiological Objects emerging from consideration of a moving vocal tract. For the Subject, these movements must be meaningful - though there would seem to be added dimensions of complexity here over and above those of speech perception, since there is, I think, a clearer distinction between the message and its form for the speaker than for the hearer. One area where the ability to describe speech in appropriate ways is particularly crucial is that of speech pathology (Caplan 1987, Kent forthcoming), where describing the situation is a large part of understanding the problem.

In the course of this thesis I have mostly been concerned to develop the implications of my view of Subject and World in an account of speech perception. But I also showed in passing its implication of the concept of *antifoundationalism*: the understanding of the scientist as Subject, and of a theory as a system of relations among Objects constituted in a context or domain. This understanding is applicable, I believe, to all scientific endeavour; but it is perhaps of more relevance to scientists themselves when they work in domains whose Objects include Subjects. These domains would seem to have greater dimensions of ontological complexity than the so-called "natural sciences", related to the distinction between the perspectives of the Subject being studied (or observed) and the Subject doing the studying (the Observer), and the need to differentiate rigorously between Objects constituted according to these two distinct points of view. Researchers in such domains therefore have the responsibility not only of justifying the relationships among Objects established by their theories, but of justifying the relevance of the Objects themselves and the point of view which gives them being. With this responsibility of course comes a kind of licence to constitute Objects in ways other than those sanctioned by the fact that they are "obvious". I hope I need not add that such licence is supposed to be used judiciously and cautiously.

If this understanding of antifoundationalism is particularly relevant in domains involving Subjects, it is surely in cases where the focus is on the Subject's linguistic abilities that it is most crucial. This is the reason for my belief that philosophical thought is indispensable in these areas. There is an opinion prevalent that philosophical thought is "speculative" thought, and only necessary in domains which lack an empirical methodology. I would like to think that this thesis itself constitutes an argument against this idea. "Observation" and "demonstration" are of course powerful tools in developing scientific understanding - but they are not straightforward processes, especially not, as I have suggested, in domains dealing with human Subjects as language users. Indeed some of these domains are commonly agreed among their practitioners to be in need of detailed conceptual analysis or even revision. I hope that the schema outlined above allows such topics to be viewed with increased clarity.

An area perhaps less obviously related that I hope my analysis can help to shed light on is that of phonetic and phonological theory[1]. Something very like an IP understanding of communication and speech perception in fact underlies almost all work in these fields - as evidenced by the almost universal preoccupation with defining formal units and formal patterns, the ontological hierarchy, and so on.

Consider the relationship between phonetics and phonology, a topic of considerable debate. From the perspective of this thesis, both these areas are abstract; both are delineated by the (tacit) consensus of the Subjects who study them; both are concerned with language as a "cognitive" ability of Subjects. There can be no suggestion that one is concrete and the other abstract, or one is cognitive and the other physical, or one is taxonomy and the other theory. One can speculate - interestingly - on what speech would be like if it was not about linguistic communication, or what linguistic communication would be like if it was not accomplished (primarily) by speech, but to try to actually conduct research as if either were the case would seem to miss most of the points about both phonetics and phonology.

Explicit acknowledgment of the complexity of issues such as description, representation, classification, existence and so on would be of great benefit in these areas, and I hope that my framework of understanding Subject-Object-Thing-World would provide the subtlety necessary to progress in long-standing debates over issues like the existence of the segment.

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[1]Allowing me to enter discussions such as those in *eg* Nolan (1982), Linell (1982), Diehl (1986), Liberman (1983), Laver (forthcoming), Perkell and Klatt (1986), Docherty and Ladd (forthcoming), Hardcastle and Marchal (forthcoming).

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